Mental Vitality: Assessing the Impact of a Walk in the Woods

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by

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DEDICATION

Dedicated to the furtherment of Ecopsychology.

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ABSTRACT

As pressures mount in the world, they take a toll upon our mental and physical capacities. A foundational principle of ecopsychology is that connection with nature positively impacts our mental and psychological health and well-being. While much research has focused on children and adults, no research into the influence of nature specifically targeting 16-18 year olds has been conducted. Additionally, this doctoral dissertation addressed the calls from literature and the gaps in the knowledge base regarding employing just one independent variable and one dependent variable in ecopsychology nature walk research. Existing commentaries are critical of many extant research projects which have sought to measure too many outcomes (in their opinion) in one study. Mixed methods research was justified and employed based upon the researcher's philosophy and the goals of the research project. This investigation examined the effect of nature walks on a population of 16-18 year olds -- students at an international school, or Third Culture Kids (TCKs), defined as a child living outside of their parents' native culture, a further novel innovation in this area of research. This study measured one aspect of mental vitality, that of mental acuity. Using the d2 Test of Attention as a quantitative measure to evaluate the impact of regular nature walks and personal reflection journals as a qualitative measure, this study found a significant improvement in participants' mental acuity in both the quantitative and qualitative results after a regular, twice weekly, 40 to 60 minute duration nature walk intervention. Implementation of nature walks into schools is highly recommended to benefit students' psychological health and well-being. Recommendations for additional research are also suggested.

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Chapter 1
Introduction

> "As long as this exists," I thought, "and I may live to see it, this sunshine, the cloudless skies, while this lasts, I cannot be unhappy." The best remedy for those who are afraid, lonely or unhappy is to go outside, somewhere where they can be quite alone with the heavens, nature, and God. Because only then does one feel that all is as it should be and that God wishes to see people happy, amidst the simple beauty of nature. As long as this exists, and it certainly always will, I know that then there will always be comfort for every sorrow, whatever the circumstances may be. And I firmly believe that nature brings solace in all troubles.
> -- Anne Frank, excerpt from The Diary of a Young Girl.

So wrote Anne Frank during her ordeal before she and her family were discovered by the Nazis. Her insight and analysis reflects the common wisdom shared by humans regarding the positive effects nature can have on the human psyche and well-being. As with many other subjects of “common knowledge,” until the past 40 to 50 years, these ideas were not subjected to scientific methodology. But the concept of nature influencing not only mental, but physical, health has had a long intuitive influence even in the absence of empirical evidence over time.

As recently as 2003, for example, a comprehensive UK government White Paper could reliably note: “Intuition and experience seem to support the notion that nature contact should be seen as a positive health intervention, yet health professionals have not yet widely adopted horticulture, wilderness, nature or animal therapy….It is, in other words, insufficiently evidence-based”. (Pretty, Griffin, Sellens & Pretty, 2003, p. 21). The report continues with a critique of much of the published research in this

area as being not well designed and therefore not reliable enough to establish a cause and effect relationship.

This present research project sought to examine the specific effect of nature walks on the participants' psychological health and well-being by examining cognitive functioning using both quantitative and qualitative measures.

Historical Precedent

Restorative gardens and natural areas were key parts of infirmaries and hospitals going back to the Middle Ages in Europe. Marcus and Barnes (1999) recount the inclusion of these features beginning with the writings of Saint Bernard as far back as the twelfth century CE to illustrate the origins in Western culture in places of healing. (Marcus and Barnes, 1999). Marcus, writing alone the following year states: "In past centuries, green nature, sunlight and fresh air were seen as essential components of healing in settings ranging from medieval monastic infirmaries, to 19th century pavilion-style hospitals, to early 20th century asylums and sanatoria". (Marcus, 2000, p. 461).

As Enlightenment and scientific revolution ideals took hold and spread, the approach to treating the mentally ill, then known as the "insane," affected treatment protocols. Dr. Thomas Story Kirkbride, who served as Superintendent of the Pennsylvania Hospital for the Insane from 1841 to 1883 believed that surroundings and environment could have a complementary effect on the healing process:

> Kirkbride's principles of design for moral treatment of the insane came to be known as the Kirkbride Plan, and influenced the design of virtually all

> American mental institutions in the late nineteenth and early twentieth centuries…...And he believed in beauty. In his 1854 *On the Construction, Organization and General Arrangements of Hospitals for the Insane,* he wrote, 'The surrounding scenery should be of varied and attractive kind and the neighborhood should possess numerous objects of an agreeable and interesting character.' The hospital building had to be situated so as to assure views from every window, especially from the parlors and rooms where patients congregated during the day. Flowers were to be grown in greenhouses, and picked daily to decorate the halls and common areas of the hospital. (Sternberg, 2009, p. 232).

But as the 19th century progressed into the 20th century and society became less comfortable with the visibility of those with mental health issues, these principles were abandoned. Mental institutions returned to the status of near prison like conditions.

However, there has been a resurgence of these healing principles through Ecopsychology in the 21st century which affirms that Kirkbride's basic principles should still be followed for maximum complementary benefits which have been found to improve emotional outlook and mood. It is noted that these design features should be included in all health care facilities be it for mental **or** physical health. More and more research is acknowledging that simply attending to the physical parts of healing is not enough but that there is a psychological component to any injury which the body receives, which has long been unacknowledged or ignored (Sternberg, 2009).

And in the treatment of purely medical (as opposed to mental) conditions, there was a parallel development in hospitals, with a prominent advocate like Florence Nightingale.

After the war, she was a major proponent of British architect Henry Currey (the designer of St. Thomas Hospital in 1868). It was based upon the pavilion principle which originated with French architect Bernard Poyet, drawing upon the natural sunlight, ventilation and airiness even in the absence of other natural elements due to its location in urban London. In Poyet's designs he incorporated large bays of windows with long hallways to facilitate airflow, placed the sanitary facilities well away from the patients, and located each bed near a window bay (Sternberg, 2009).

Nightingale's ideas and concepts crossed the Atlantic and were incorporated into the design of the Royal Victoria Hospital in Canada in 1893. Features were incorporated such as twelve foot ceilings and large windows to allow sunlight and air into the public wing and maternity wards, while affording views of the hillsides and woods with the express intent of allowing patients to view nature. The nearby Children's Hospital included allowing the children outdoor time within their limitations which was seen as crucial for their healing (Sternberg, 2009).

The relationship between stress reduction and viewing nature scenes was demonstrated empirically shortly after Ulrich's ground-breaking 1984 study detailing accelerated recovery from surgery for subjects who had a nature view during recovery. Ulrich *et al.* (1991) designed an experiment to artificially stress participants through the viewing of a video and then viewing one of six "recovery" videos -- two of nature scenes and four urban. 120 undergraduate volunteers (60 male/60 female)

participated and had 4 physiological measures taken immediately before and throughout the viewing of the videos. These were Electrocardiogram (EKG), pulse transit time (PTT), spontaneous skin conductance responding (SCR), and frontalis muscle tension (EMG). “The results strongly support the conclusion that recuperation was faster and more complete when subjects were exposed to natural settings rather than the various urban environments”. (p. 222).

And right up to the current day, the importance of the environment in helping to reduce stress to improve healing can be seen in Maggie’s Centres throughout the UK and around the world. Charles Jencks, along with his late wife Maggie Keswick Jencks, formed the charity to encourage complementary therapeutic treatments incorporating features championed by the renowned architect Frank Gehry. “The architect Charles Jencks, when interviewed in a PBS television documentary directed by Sydney Pollack, said that Gehry ‘is committed to a notion of an architecture that relates to healing.’ Jencks should know. Gehry designed a tranquil, restorative refuge in memory of Jencks’ wife, Maggie Keswick, who died of cancer. This small, whimsical, modernist building, reminiscent of a thatched-roof cottage, is set in the rolling countryside near Dundee, Scotland, and is one of a series of Maggie’s Centres designed by master architects. It is filled with places for reflection, and provides views of the peaceful hills all around”. (Sternberg, 2009, p. 166).

Early Psychologists’ Views on Nature

> “You must go in quest of yourself, and you will find yourself again only in the simple and forgotten things. Why not go into the forest for a time, literally? Sometimes a tree tells you more than can be read in books.” The Earth Has a Soul: C. G. Jung on Nature, Technology & Modern Life ed. by Sabini

After psychology had become a separate discipline from philosophy in the latter part of the 19th century, two influential popular figures were Sigmund Freud and Carl Jung. Their theoretical formulations are considered less scientific nowadays than later psychologists as many of their concepts were built upon anecdotal data, but the quote above emerges from Jung's experience with Analytical Psychology. And, while still anecdotal, is an opinion moving closer from simply "common knowledge" to that of an experienced psychologist. Jung believed in an intimate inter-relationship between each human being and the world around them. His admonition recognizes the same common wisdom humans seem to instinctively know: that contact with nature can make us "feel better." This innate feeling is many times at direct odds with our current age, however, as the number of people dwelling in cities and having little contact with nature is at a record level, replaced by increasing contact with virtual reality and technology (Pergams and Zaradic, 2008).

Consequently, humankind is facing increasing physical and psychological challenges from the accelerating pace of modern life -- from the overwhelming quantities of information inundating individuals during 24 hours of each day, to the constant sensory stimuli from a variety of media, including mp3 players, televisions, mobile phones, and the Internet. Meanwhile, social pressure within the workplace to increase effort contributes to additional mental fatigue. The cumulative effect of these has been observed to take a toll on an individual's physical health, concentration, alertness and focus (American Psychological Association, 2013; Bratman, Hamilton and Daily, 2012; Buzell and Chalquist, 2015; Kaplan and Kaplan 1989; Tennessen and Cimprich 1995; van den Berg, Hartig & Staats, 2007).

While there are various approaches and strategies to address these issues,

ecopsychology is the specialization within psychology in which the disconnection of the individual/patient from nature is seen to contribute to her/his problem; the counterbalance indicates that the reconnection of the individual with nature is part of the solution (Roszak, 1992). Ecopsychology is influenced by biophilia which is defined as "...a human dependence on nature that extends far beyond the simple issues of material and physical sustenance to encompass as well the human craving for aesthetic, intellectual, cognitive, and even spiritual meaning and satisfaction" (Kellert and Wilson, 1993, p. 20) and leads to healthiness and wellness, but conversely, can lead to various forms of dysfunction -- if there is a disconnect from nature.

Many subdisciplines of psychology also recognize a nature-psyche connection, even if their main focus is not ecopsychology. Gardner (2006) in his Multiple Intelligences theory proposes a naturalistic intelligence which suggests a human cognitive connection to nature. Psychodynamic theorists also note a strong connection between nature and psychological health (Jordan 2009). Maslow, a key humanistic theorist, includes place-based elements in the two basic levels of needs: physiological and safety. Elements in both of these include the need for physical shelter and the ability to feel safe and secure (or attached) to the place in order to be psychologically healthy (Maslow, 1943). Louv (2005) focused on the lack of connection to nature with a number of psychological conditions among children, and similar to Roszak, proposes that at least a part of the solution is helping children to interact with nature more frequently. This disconnection from nature has been further documented by Pergams and Zaradic (2008, p. 2295) where "...all major lines of evidence point to an ongoing and fundamental shift away from nature-based recreation." And disturbingly, the shift appears to be because of videophilia -- defined

as overly attached to televisions and tablets -- placing further distance between humans and nature. Orr (2004) reflects on the importance for each of us to connect with nature, “I do not know whether it is possible to love the planet or not, but I do know that it is possible to love the places we can see, touch, smell, and experience”. (ebook Loc. 1786).

Contemporary Structural Obstacles

But current thought questions the ability of humankind to solve the environmental problems facing the world today due to both a willful disregard of the underlying causes as well as the basic economic structure of the world. Commenting on the plethora of environmental problems constantly surrounding us, Orr (2004) reflects: “These facts only appear to be random. In truth, they are not random at all but part of a larger pattern that includes shopping malls and deforestation, glitzy suburbs and ozone holes, crowded freeways and climate change, overstocked supermarkets and soil erosion, a gross national product in excess of $5 trillion and superfund sites, and technological wonders and insensate violence. In reality there is no such thing as a “side effect” or an “externality.” These things are threads of a whole cloth. The fact that we see them as disconnected events or fail to see them at all is, I believe, evidence of a considerable failure that we have yet to acknowledge as an educational failure. It is a failure to educate people to think broadly, to perceive systems and patterns, and to live as a whole person”. (p. 91).

Orr, 2004, continues in his introduction to dissect this continued duality of thought where humankind acknowledges grave environmental issues while continuing to engage in destructive behaviours in this introduction to a collection of essays regarding the interaction of the mind and nature:

> They are joined by the belief that the environmental crisis originates with the inability to think about ecological patterns, systems of causation, and the long-term effects of human actions. Eventually these are manifested as soil erosion, species extinction, deforestation, ugliness, pollution, social decay, injustice, and economic inefficiencies. In contrast, what can be called *ecological design intelligence* (italics original) is the capacity to understand the ecological context in which humans live, to recognize limits, and to get the scale of things right. It is the ability to calibrate human purposes and natural constraints and do so with grace and economy. Ecological design intelligence is not just about things like technologies; it also has to do with the shape and dimension of our ideas and philosophies relative to the earth. At its heart ecological design intelligence is motivated by an ethical view of the world and our obligations to it. On occasion it requires the good sense and moral energy to say no to things otherwise possible and, for some, profitable. The surest signs of ecological design intelligence are collective achievements: healthy, durable, resilient, just and prosperous communities. (p. 104).

Koger and Winter in 2010 add further commentary to this phenomenon of denial: “Somehow, people must split off their awareness so that they understand environmental problems and yet forget them at the same time. Apparently, people do not behave as intelligently and consciously as they think they do. These considerations lead us to consider the enormous contributions of psychoanalytic psychology, and its founder Sigmund Freud, the first and most influential psychologist to theorize about the unconscious”. (p. 63).

One suggestion is that the very foundation of the Western mindset perpetuates the misuse of the natural world and resources: “In this way, Western thinking is dominated by a line -- of progress, of power, and of consciousness (or closeness to God). The line is a potent basis of modernist visions. It sanctions and promotes the idea of growth, which is good, and diminishes the value of sustainability, which is stagnation. The line promotes resource extraction, production, consumption and waste to the detriment of finding ways to reuse waste as food for the next cycle….Here our point is that people in industrialized societies are deeply wedded to the hope of progress, improvement, growth, ascendance, and enhancement”. (Koger and Winter, 2010, p. 56). With a defining philosophy such as this, then, the very foundation of the definition of success in Western society would exclude the concept of something being “merely” sustainable, and in fact, make sustainability undesirable.

This theme -- the suggested incompatibility of acting to prevent further climate change with capitalism -- has been picked up and analysed fully in a book-length examination by Naomi Klein (2014) This Changes Everything: Capitalism vs. The Climate. In this detailed analysis, Klein points out the fundamental incompatibility between capitalism and ecologically sensible policies. She calls attention to the disconnect between the core tenets of capitalism which include ever-expanding markets and unlimited resources and the realities of the world. Indeed, so many resources are very limited, while many other resources are reaching the end of their supply or becoming so polluted as to be unusable. Climate change is wreaking havoc on areas of the world and presently the state of California in America is experiencing its worst drought in history, highlighting the devastating effects that

continuing to follow market principles has on the environment. She can confidently conclude: “Right now, the triumph of market logic, with its ethos of domination and fierce competition is paralyzing almost all serious efforts to respond to climate change”. (p. 23).

Given these challenges, is there evidence to support the concept of nature contact being beneficial to human psychological health and well-being?

Study Development

This modest research project has attempted to study the intersection of nature and its various restorative influences upon the human psyche. There is much intuitive knowledge that informs humankind’s opinions regarding the beneficial effects of nature-related experiences on human health and well-being, but gaps exist in the literature to support this intuitive understanding with empirically-based evidence. The effect on mental functioning of direct contact with nature in the form of nature walks is what the present project undertook to examine. Responding to calls in the literature for narrowly focused research projects, only one independent variable and one dependent variable were studied -- the nature walk and a measure of mental functioning, respectively.

The target population group for this study has been 16-18 year old students. This has been an overlooked population in previous research studies which have tended to either focus on children up to about age 16 or university age and higher adults. Further, a subset of this group, students at an international school, were examined. This is because while developmentally all 16-18 year olds are defining themselves and making connections, students at an international school may in fact feel less

connection to the world around them because of their peripatetic lifestyle situations. Contact with nature could also enhance their grounding and identity as they continued to grow and develop, in addition to the psychologically restorative effects on cognitive functioning.

Therefore, **the research questions to be examined are**:

To what extent do nature walks have a positive impact upon psychological health specifically cognitive attention?

How do participants describe the nature walk experience?

Organization of Dissertation

There are six chapters to this dissertation. Chapter 1 contains the research question and sets the topic in context. Chapter 2 discusses relevant background research and related-field research. Chapter 3 presents theoretical and practical methodology principles. Results are detailed in Chapter 4, while Chapter 5 interprets the results and Chapter 6 discusses practical implications and recommendations for further research.

Chapter 2

Literature Review

In this chapter, I will examine the literature relevant to the background of the current study. I will also provide working definitions for the concepts being explored. The topic of the impact of nature upon psychological health and well-being is by definition cross-disciplinary and so correlates and precursors from a wide variety of fields will be examined. This chapter will be subdivided into General Background and Topic Specific Research sections.

Following this review, the limitations from prior studies will be identified as well as the knowledge gaps which emerged and will be presented along with the research question and hypothesis. Finally, key terms will be identified and defined.

General Background Studies and Antecedents

Philosophical Foundations: Evolutionary Psychology and/Biophilia

Many practicing ecopsychologists feel that Ecopsychology itself draws inspiration from another subfield of psychology, that of Evolutionary psychology. Sampson, in a chapter written in 2012, makes explicit this connection and proposes the Topophilia Hypothesis which he defines as humans' innate desire to bond with a local place including both living and nonliving elements. Evolutionary psychology examines characteristics of the human psyche through the lens of humankind's evolutionary development. By examining contemporary human experiences and comparing that with a variety of historical sources including both anthropological and archaeological

evidence, logical conclusions can be drawn as to how and why humans behave currently, and in the past, and the evolutionary path that connect the two.

One hypothesis arising from evolutionary psychology is the Biophilia hypothesis. Biophilia entered into the lexicon of psychology with Erich Fromm. For Fromm, it was a more general term: “Biophilia means, of course, love of life. For Fromm, biophilia is the essence of humanitarian ethics, which is the central theme of every one of his books”. (Eckardt, 1992, p. 233).

Edward O. Wilson, explaining his expanded concept of biophilia in his 1984 book Biophilia, defines it as “the innate tendency to focus on life and lifelike processes….We learn to distinguish life from the inanimate and move toward it like moths to a porch light…...to explore and affiliate with life is a deep and complicated process in mental development.” (Wilson, 1984, p. 1-2). He thus locates the propensity of human beings to affiliate with nature and nature-like settings with our evolutionary history.

In a follow up volume edited by Kellert entitled the Biophilia Hypothesis, the explanation was expanded to note that the innate dependence on nature evolved in our species and manifests itself in every level of human functioning: affective, cognitive, spiritual, and physical, and therefore should affect our species desire to preserve and conserve the natural environment. (Kellert, 1995).

Besides this innate attachment, what are the specific mechanisms that are proposed that engender this continued appreciation and attachment to nature? One such explanation involves a “re-balancing” of internal thoughts and feelings. In a

beautifully poetic passage Kellert (2003) observes: “Perceiving beauty in nature can engender feelings of harmony, balance, and symmetry, no matter how fleeting or even illusory these feelings may be. Certain elements of the natural world offer a model of perfection in form. We discern unity and symmetry in the brilliance of a colorful butterfly or crane, the flowering of a desert cactus or rose, the funneling of breaking waves, the grandeur of snow-capped mountains, the breaching of humpback whales, the bugling of elk at the height of their breeding impulse. Each suggests a glimpse of perfection in a world where frailty, shortcoming, and chaos often seem normative. These encounters may be infrequent, but they occur with sufficient regularity to suggest an ideal of perfection in nature and life”. (p. 36). Wilson focuses on the concept of “wonder” in humankind’s interactions with nature: “Now to the very heart of wonder. Because species diversity was created prior to humanity, and because we evolved within it, we have never fathomed its limits. As a consequence, the living world is the natural domain of the most restless and paradoxical part of the human spirit. Our sense of wonder grows exponentially: the greater the knowledge, the deeper the mystery and the more we seek knowledge to create new mystery. This catalytic reaction, seemingly an inborn human trait, draws us perpetually forward in a search for new places and new life. Nature is to be mastered, but (we hope) never completely. A quiet passion burns, not for total control but for the sensation of constant advance”. (Wilson, 1984, p. 10).

While humankind has made vast progress in the last 10,000 years, moving from hunter gatherer tribes, to modern day urban dwellers for the most part, our evolutionary psychology has yet to catch up; humankind still essentially is wired to live out among nature. Our natural environment has to have had an impression upon

our cognitive and emotional abilities. “This process is referred to as a gene-culture coevolution wherein a certain genotype makes a behavioural response more likely”. (Gullone, 2000, p. 295).

As with other concepts within evolutionary psychology, biophilia proves challenging to be able to test empirically. By the very nature of the discipline, extant evidence and records are consulted and conclusions drawn which do not lend themselves to testability. However, Kahn in 1997 designed a research project directly based upon testing the biophilia hypothesis with children. In a cross cultural study of children conducted by Kahn in 1997 in the USA, Canada and Brazil, children were interviewed concerning their level of awareness, knowledge and appreciation of nature which data could then be used to conclude about biophilia. “Empirically, my collaborative research supports the biophilia hypothesis, and fleshes it out developmentally. Our research, for example, reveals ways in which children have an abiding affiliation with nature, even in economically impoverished urban communities where such affiliations seem least likely…..Thus, in line with the biophilia hypothesis, it may be that there are aspects of nature itself, that help give rise to children’s environmental constructions”. (Kahn, 1997, p. 54).

But multiple other branches of psychology also lend support to this intricate relationship between nature and the human psyche. In Cognitive psychology, for example, Howard Gardner in modifying his Multiple Intelligences theory, proposes a naturalist intelligence. He feels that the “...the evidence for the existence of a naturalist intelligence is surprisingly persuasive”. (Gardner, 2006, p. 18). This

intelligence involves the ability to “distinguish the diverse plants, animals, mountains, or cloud configurations in their ecological niche”. (p. 19).

Psychodynamic theorists also have noted a relationship between “person and planet” (Jordan, 2009, p. 26). Essential to this theory is a healthy and secure development of the concept of self and others. According to this perspective, those who do not, may experience psychological issues. In the contemporary expanding view of “others,” attention has been directed to the inclusion of the nonhuman environment in this description. “...(N)ature can be seen as representing a secure base, an aspect of both our internal and external relational world that can provide great comfort”. (p. 28).

Ecopsychology: Counterculture Movement to Mainstream Science

Ecopsychology began its re-emergence into mainstream science and psychology in the 1990’s. One major stream of influence that contributed to Ecopsychology was Psychoecology, a term coined by Robert Greenway in a 1963 essay he published at Brandeis University (Schroll, no date). In the 1960’s and 1970’s, however, while psychoecology had a scientific following, it also became a movement embraced by the counterculture movement which therefore diluted its scientific *bona fides*. It was not until 1992, though, when a graduate student of Greenway’s had begun a discussion group about psychoecology in California that attracted the notice of Theodore Roszak, who in turn published an essay and then a book in 1992 entitled The Voice of the Earth, that it began its truly scientific rise. In it Roszak communicated his view of Ecopsychology, perhaps wanting to avoid the possibility of

being called a “Psycho Ecologist!” The movement then began its slow scientific resurrection. (Schroll, no date).

Ecopsychology continued to plod along until a kind of convergence of a variety of factors. During the first decade of the 2000’s, it became apparent that the predictions of seeming doom and gloom about the future of the environment were indeed coming true. Al Gore toured the United States and parts of the world, raising awareness of the reality of the environmental crisis approaching largely through his “An Inconvenient Truth” tour. And a professional peer-reviewed journal entitled “Ecopsychology” was founded in 2009. These events propelled the status of ecopsychology from a little-known subdiscipline of psychology with New Age ties to the mainstream of psychology as a full-fledged reputable part of mainstream psychology.

Divisions still remained, however. Those who had joined the “ecopsychology movement” and had little interest in the science side did not go away. And there remain basic philosophical differences even among the scientists in the discipline, but it has emerged to be the force it hoped to become to help both the environment and people’s psychological health and well-being at the same time by raising awareness that these two things are not at all unrelated, but rather actually intimately interrelated to one another for the health of both (Doherty, 2009).

The intimate relationship between nature and healing was explored by Hegarty in 2010. In his article he notes that “Nature-connectedness is a core concept in ecopsychology” (p. 64). He states that it is difficult to design research specifically to test the hypothesis of the positive benefits of nature on psychological health because

of the possibility of so many confounding variables. So, he designed a “qualitative, narrative, and ethnographic” (p. 66) study to try to overcome those issues. He sampled the opinions of two groups regarding the participants’ nature connectedness, disconnectedness, and connectedness and self-healing. The two sample groups were “17 members of a European research group on ‘green care and health’” and “26 university postgraduate counselling students ranging in age from 22-62 years”. (p. 67). While acknowledging the inbuilt bias in the samples, he believes it is still indicative of “the notion that connectedness to nature is a concept that is in at least some people’s everyday experience and that they can relate it to their health”. (p. 79). In response to the first question which all participants responded to regarding connectedness to nature, “The positive emotional tone runs through all the contributions to Question 1”. (p. 69). His findings regarding the second question which dealt with nature disconnectedness and which was answered by all participants were: “The answers to Question 2 hint at those to the final question, showing that people found nature-contact personally meaningful and emotionally valuable”. (p. 75). The third question asked the participants to consider the relationship of nature and their own well-being. This was a semi-structured question in that there was a Likert scale with room for additional comments. “Thirty-eight of the 43 respondents ‘agreed’ or ‘strongly agreed’ with the statement….’Being connected with the natural world is a positive force for healing’”. (pp. 75-6). Question 4 was open ended to expand upon their standardized answer in question 3. “Furthermore, their responses show that some individuals regularly seek out nature-experiences to help their emotional or physical health, or link a nature-connected experience to an important psychological time in their life”. (p. 79). He concludes: “Based on the data reported here, nature-connected experiences seem to be

strongly emotional, and positively so. Emotions include not only relaxing and pleasant ones but also those which are described as religious". (p. 80). Thus this empirical research strongly supports the biophilia hypothesis, as well as nature-based interventions to improve psychological health and well-being as advocated by ecopsychology.

The focused attention on the influence of environmental factors on various aspects of human health and well-being is giving rise to new fields of study and specializations. This includes, for example, the discipline of acoustic ecology. While it had precursors in the 1960's, similar to ecopsychology, it has garnered much more attention and involvement, particularly since 2000, when its peer-reviewed journal, The Journal of Acoustic Ecology, was launched. One of the major ways in which the surrounding environment is mediated to human beings is through the sounds received by each of our acoustic receptors -- or ears. And this particular discipline examines both the positive and negative impacts that sound from the surrounding environment, and the interpretation of sound, can have on our well-being (Wrightson, 2000).

Turning to children specifically, in 2002, the issue of the importance of the consideration of the various influences that environment can have on children, was examined by Isenberg and Quisenberry. They observed: "Outdoor play is significantly different from indoor play. The outdoor environment permits noise, movement, and greater freedom with raw materials, such as water, sand, dirt, and construction materials." (p. 35). While not directly addressing the specific benefits to

children of contact with nature, they do highlight the importance of outdoor play which would be an underlying principle to that specific outdoor environment.

Richard Louv, in 2005, published a provocatively titled book, Last Child in the Woods: Saving our Children from Nature-Deficit Disorder. His analysis connects many contemporary behavioral and psychological “issues” among modern children to their disconnection from nature:

> The postmodern notion that reality is only a construct—that we are what we program—suggests limitless human possibilities; but as the young spend less and less of their lives in natural surroundings, their senses narrow, physiologically and psychologically, and this reduces the richness of human experience.
>
> Yet, at the very moment that the bond is breaking between the young and the natural world, a growing body of research links our mental, physical, and spiritual health directly to our association with nature—in positive ways. Several of these studies suggest that thoughtful exposure of youngsters to nature can even be a powerful form of therapy for attention-deficit disorders and other maladies. As one scientist puts it, we can now assume that just as children need good nutrition and adequate sleep, they may very well need contact with nature. (Louv, 2005, p. 3).

From this we can see, based upon empirical data and theoretical interpretation, that there is an intimate connection between quality of psychological health and well-being and connection with the natural environment. Nature-deficit disorder posits that many modern psychological “issues” are nothing more than the requisite nature connection which our psyches long for.

Indeed, a public service guide published by the USDA Forest service in 2010 cited further research into the importance of outdoor activities for children and

recommends: “Educational theory suggests that contact with nature facilitates children’s development of cognitive, emotional, and spiritual connections to social and biophysical environments around them”. (Wolf and Flora, 2010, p. 3).
This concept was validated in a recent Annal of the New York Academy of Sciences issue which focused on The Year in Ecology and Conservation Biology 2012. One of the reports reinforced this identical point: “As we move into cities and indoors at an unprecedented rate, we are faced with a rapid disconnection from the natural world, and this opens a suite of critical questions about repercussions for psychological well-being”. (Bratman *et al.,* 2012, p. 119).

A recent news story on the American National Public Radio show “All Things Considered” covered an elementary school in the state of Vermont where a kindergarten class spends every Monday out in the forest -- no matter the weather. Called “Forest Monday” the teacher and the principal cite a plethora of benefits, not the least of which are improvement in noncognitive skills such as persistence and self-control. The classroom is a natural setting for contextualized learning and according to the principal of the school, “When the kids come back from the woods, they look healthy and happy” (Hanford, 2015) which is an anecdotal illustration of the positive impact that nature can have on psychological well-being.

Emotional Benefits, Social Work, Place Attachment, and Political Science

While the previous section focused on some of the cognitive benefits involved with nature and attention restoration, research is also being conducted into emotional benefits of nature interactions. Building upon generations of “common knowledge” regarding the importance of place, and in particular, nature in the role of healing and

healthiness, many related disciplines have contributed to, and benefit from, this renewed attention to Ecopsychology.

Research by Marselle, Irvine and Warber from 2014 examined effects of nature walks upon various affective measurements among a large sample (N=1516) of mainly age 55+ individuals (88.3% of sample). They were able to support their hypotheses that nature walk participants “reported significantly less depression, perceived stress, and negative affect and significantly greater mental well-being and positive affect than individuals who did not take part in the group walks”. (p. 141). This result supports the efficacy of nature walks in helping humans with the affective domains.

One example of an emergent discipline which has manifested in the academic field of geography is medical geography. This is an evolving field which has become very focused on the therapeutic value of certain places and the commonalities which they share which seem to contribute to healing. “Symptomatic of such changes in the discipline has been emergence of a significant body of research focused on the relationship between place and varied therapeutic practices”. (Smyth, 2005, p. 488). Examining the development of this discipline, Smyth recounts the history of the discipline as beginning with examinations of places of “extraordinary” healing such as Lourdes, Bath, etc. Throughout time, humans have associated healing properties to basic elements such as water, fresh air, and landscapes. Indeed, one only needs to consider the development of various institutions of healing going back to the 19th century and beyond to see this influence. “The location of institutions of health care has tended to reflect the ways that diseases and health are socially constructed. In

the nineteenth century, for example hospitals were designed to incorporate fresh air, adequate daylight and low population densities (Gesler *et al.*, 2004)...In essence, philanthropists of the time sought to bring elements of rurality into the institution and thereby, address the suspected cause of much illness, namely urban living“. (Smyth, 2005, p. 490). She concludes her article by observing that based upon emerging research, planning spaces for therapeutic treatment can incorporate features to not only cure disease but promote health.

One unique piece of research also ties into the concept of nature and place attachment. As is discussed elsewhere regarding the population studied, Third Culture Kids, these results can be highly relevant. “An element of emotional happiness can be attributed to familiarity with place or place attachment. Processes of attachment and emotion regulation are highly related…...The possible next step may be to experience safety in the place, and feeling of security did indeed emerge as a theme in the narratives reported by Morgan (2010). It may even be possible to speak of the place as a secure base, and even nature itself as a secure base…..People may enter into relationships with specific natural places, feel safe, and feel soothed by being in a specific place”. (Johnsen, 2011, p. 180).

The issue of the interrelationship between the natural environment and our psychological health and wellbeing is not confined to academia. An article in “Wired” magazine in 2008 entitled “Clive Thompson on How the Next Victim of Climate Change Will be our Minds” outlines the problems and challenges faced by individuals as the natural environment around them changes. “Their environment is moving away from them, and they miss it terribly” (Thompson, 2008). He goes on to

conclude that: “Ironically, we may simply be rediscovering a syndrome that we thought was dead and buried. Back in the 1940s, the military considered homesickness to be a serious and potentially fatal illness, because drafted soldiers who got shipped overseas would often become savagely depressed…..Few of us have the experience of being unmoored in the world”. (Thompson, 2008). Then in 2010, a New York Times Magazine piece further brought the matter to the general public presenting the case for “solastalgia” which involves an involuntary break with the surrounding natural environment due to external forces beyond the control of the individual such as strip mining or mountaintop removal mining. The article recounted in depth Glenn Albrecht’s pioneering work in the field and examined both supporters and critics (Smith, 2010).

Back in academia, though, the emerging research indicates that at times it is possible to become disconnected from one’s home “place” and nature without leaving -- rather when the natural landscape is drastically changed or disrupted by human interventions, such as coal mining or when it is affected by changing weather patterns caused by human induced global warming. Albrecht, Sartore, Connor, Higginbotham, Freeman, Kelly, Stain, Tonna and Pollard (2007) have proposed a new condition known as solastalgia: “solastalgia is the distress that is produced by environmental change impacting on people while they are directly connected to their home environment”. (Albrecht *et al*., 2007, p. S95). They further propose that this condition is a psychoterratic illness. “Psychoterratic illness is defined as earth-related mental illness where people’s mental wellbeing (psyche) is threatened by the severing of the ‘healthy’ links between themselves and their home/territory” (p. S95).

Research leading to this proposal came from two separate studies. In the first, 60 people in the Upper Hunter Region of New South Wales in Australia were interviewed. This location was chosen in response to many local people in the community reaching out to Dr. Albrecht complaining of symptoms which resembled severe homesickness but paradoxically all of whom were still living at home. The research team conducted key informant, community member, and group interviews. What they found in common was that: “Their sense of place, their identity, physical and mental health and general wellbeing were all challenged by unwelcome change” (p. S96). Themes emerged which included: “the loss of ecosystem health and corresponding sense of place, threats to personal health and wellbeing and a sense of injustice and/or powerlessness”. (p. S96). This qualitative data was validated by use of a quantitative instrument, the Environmental Distress Scale.

The Environmental Distress Scale (EDS) was validated in a separate work by Higginbotham, Connor, Albrecht, Freeman and Agho in 2006. The purpose of the development of the instrument was to offer a quantitative measure for the distress associated with a changing environment -- where the subject has not changed, but rather the ecological setting around them has. “The EDS is designed to measure distress either from direct experience of environmental disturbance or from the anticipation of potential disturbance…...In areas devastated by human and natural events such as mining, drought, hurricanes, and even war, the EDS can identify that component of people’s distress arising from solastalgia, the lived experience of home and home environment desolation”. (Higginbotham *et al.*, 2006, p. 253).

Additional empirical support for the condition of solastalgia can be found in a recently published research article by Sangaramoorthy, Jamison, Boyle, Payne-Sturges, Sapkota, Milton and Wilson (2016). The researchers targeted Doddridge County in West Virginia, based upon extensive fracking which was occurring along the Marcellus Shale (one of the largest shale formations in the USA) and the potential for disruptions in the environment due to this development. Subjects were recruited using various public media to invite anyone who felt that their lives had changed since the fracking began. Thirteen subjects participated in two focus groups using open ended standardized questions. Those who were long-term residents described their feelings of loss and distress over the deterioration of the surrounding natural environment. Because of the decline in property value, many could not leave and this factor compounded their feelings of loss and stress. While the authors of this study did not specifically use the term solastalgia (even though Albrecht is included among their background sources) these symptoms are consonant with the condition as proposed by Albrecht, *et al.* (2007).

Hasbach (2015) acknowledges solastalgia as a condition to be considered by psychotherapists which contributes to “eco-anxiety.” Recommendations for treatments with the consciousness of this new etiology included three points. The first is to broaden the therapeutic focus from just intrapersonal and interpersonal/social to include the person in environment as a possible factor in diagnosis/treatment. This would include the second point of expanding the intake interview to include questions about the client’s relationship with nature and the environment. And finally, when appropriate, to assign nature-based homework for clients or “rewilding therapy” (p. 207) as she terms it.

Similarly, the concepts surrounding place attachment have value for related disciplines such as social work. A key concept underlying social work is that the individual feels a part of a group or something greater than her/himself, and not just limited to other human beings as discussed in a 2009 piece by Norton: “We are disconnected when we experience *detachment* from nature and view it as a separate or other, instead of something of which we are a part” (p. 140). She argues that ecopsychology can inform and complement traditional social work: “However, just as ecopsychology can help explain the human etiology of environmental destruction, it can help social workers transform the notion of person-in-environment to include the natural world in a way that promotes a broader view of human empowerment and well-being. Connection to the natural world occurs when we are in relationship with nature, experiencing a deep *attachment* to the planet. Connection also occurs when we place ourselves in the larger ecosystem *equally* with other living things and do not seek domination over the natural world”. (Norton, 2009, p. 140).

Concepts regarding place attachment and ecopsychology impact many political discussions and decisions, but a particular political movement is based upon organizing political divisions on ecological biosystems. This system is known as bioregionalism. “Bioregionalism is a body of thought and related practice that has evolved in response to the challenge of reconnecting socially-just human cultures in a sustainable manner to the region-scale ecosystems in which they are irrevocably embedded”. (Aberley, 1999, p. 13). This could be thought of as place attachment translated into a political governing unit, or state, based upon biosystemic completeness. A particularly long lived movement is the Cascadia independence movement which one pro-independence organisation describes as: “a unique coastal bioregion that defines the Pacific Northwest of the United States and Canada,

incorporating British Columbia, Washington, Oregon, parts of Idaho, southern Alaska and northern California. This area is in many ways geographically, culturally, economically and environmentally distinct from surrounding regions". (Cascadia Now, 2015). This is but one example of worldwide movements seeking to realign political designations around ecological biosystems.

Ecotherapy

A related field to this research project is Ecotherapy. "Ecotherapy is an umbrella term for a gathering of techniques and practices that lead to circles of mutual healing between the human mind and the natural world from which it evolved". (Chalquist, 2009, p. 64). Chalquist (2009) in a comprehensive review examined evidence of ecotherapy practices and their efficacy. His conclusion based upon this analysis included that disconnection from the natural world produces a variety of psychological symptoms and that reconnection (he specifically mentions nature walks outside as one modality) can alleviate these deficits and even contribute to a renewed sense of purpose in life.

The current research project is focused on maintaining everyday mental health while Ecotherapy is therapeutically assisting individuals to resolve various psychological issues using nature and the environment, so both are related disciplines, in much the same way that medicine and preventative medicine are related fields.
Ecotherapy as a practice long pre-dated the current text entitled Ecotherapy (Buzzell & Chalquist, ed.) from 2009, but this volume collected writings from various practitioners in the field. In the Foreword, David Orr traces the recognition and attention that connecting nature and psychological health and wellness is currently

receiving. Research into ecotherapy, or integrating nature into treatments and therapeutic interventions, has also seen an increase. As a recent article in the APA's Monitor on Psychology notes, "More psychologists are using the wilderness as a backdrop and therapeutic tool in their work". (DeAngelis, 2013, p. 49). In this same article psychologist Scott Bandoroff, who uses nature and the wilderness as an integral part of his therapeutic treatments, was interviewed and this was noted: "For Bandoroff, there is no doubt that the combination of being in a beautiful natural setting and working through your issues with highly trained professionals is a winning one that more psychologists should consider exploring". (DeAngelis, 2013, p. 52). While it seems intuitive that nature could help with human psychological health and restoration, these beliefs and claims have not been well documented and supported by empirical testing.

One piece of research whose main focus was integrating physical activity into the treatment plans for persons suffering from serious mental illness, did consider the benefits of walking. "Although structured group programs can be effective for persons with serious mental illness, especially walking programs, lifestyle changes that focus on accumulation of moderate-intensity activity throughout the day may be most appropriate". (Richardson *et al.*, 2005, p. 324).

In a comprehensive White Paper prepared in 2007, Mind, the UK charity formerly known as the National Association for Mental Health, reviewed the findings to that point of research and original articles concerning the possible benefits of Ecotherapy. A summary of some of the key findings follows here (Mind, 2007):

“Research has found that there is a relationship between lack of green space in urban areas and levels of stress (Grahn and Stigsdotter, 2003).” (p. 5)

“Terry Hartig argues that nature can restore deficits in attention arising from overwork or over-concentration…” (p. 7)

After participating in Mind’s ecotherapy programmes, “Ninety-four percent of those surveyed highlighted particular mental health benefits. Many respondents said that they felt mentally healthier, more motivated and more positive. They felt the green exercise helped to lift depression and instill feelings of calm and peacefulness. Their overall mood, confidence levels and self-esteem all improved.” (p. 20).

Finally, the conclusion to the report suggested: “Ecotherapy is emerging as a clinically valid treatment option for mental distress, and a core component of an adequate public health strategy for mental health”. (p. 28).

In their follow-up report some six years later (2013), Mind in a report entitled “Feel better outside, feel better inside” was able to observe regarding the various research projects over the six years: “Seven out of ten people experienced significant increases in wellbeing by the time they left the project. The type of project people got involved in didn’t seem to make any difference, nor did their age”. (p. 21). Among many other noticeable benefits: “With mental health problems such as anxiety and depression increasing significantly, ecotherapy can improve physical health and mental wellbeing. Its flexibility as an intervention means it can be used as a wellbeing service that people can use to look after their mental wellbeing, an early intervention to support people who may be at risk of developing a mental health problem, or as a treatment in its own right”. (p. 39).

However, another piece of research into a residential wilderness therapy program unexpectedly found no improvement in participants' mental health and well-being. One possible explanation for this result, however, could be that participants were only exposed to ecotherapeutic interventions for a total of 3 hours out of possible 168 hours (seven 24 hour periods) residential (Wilson *et al.*, 2011, p. 51).

In a comprehensive review article, Brymer, Cuddihy, and Sharma-Brymer (2010) were able to conclude: "Exposure to non-human nature has benefits for a variety of wellness related constructs. Theoretical perspectives suggest a range of possibilities 1) contact with nature acts as a medium for restoration, 2) contact with nature provides an opportunity for emotional care, 3) nature provides a mirror for in-depth reflection or 4) contact with nature provides an opportunity to rekindle an innate union. That is, theoretical perspectives point to broad possibilities as to why being in nature enhances wellness". (p. 24). Recommendations for incorporation of ecotherapy are not just confined to academia, however. There are a plethora of recent UK government initiatives and guidance regarding the incorporation of ecotherapy in communities for a variety of benefits. For example, the above-referenced "Feel better outside, feel better inside: Ecotherapy for mental wellbeing, resilience and recovery," by Mind UK (2013), recommends: "This government framework identified five key areas for action to promote wellbeing. Ecotherapy works across all of these domains offering a holistic service to promote wellbeing in the community," (p. 10) and "A recent report by Mind and The Mental Health Foundation, identifies three key components of an effective strategy to promote resilience and recommends that public health teams should plan to ensure access to

services, such as ecotherapy, that prioritise building resilience and preventing mental health problems". (p. 11).

Further research specifically examined the efficacy of allotment gardening, examining two aspects: "doing" the gardening and "being" in the natural setting (Hawkins, Mercer, Thirlaway, and Clayton, 2013). This was conducted in Cardiff in Wales using 14 participants who engaged in allotment gardening. A semistructured interview was deemed the most appropriate instrument, as the subject's individual impressions of the gardening experience were most relevant to the research goals. Thematic analysis was then used to identify key themes. Their findings showed that participants described "doing" as: (a) distraction, physical activity, doing something, Sharing: Expertise, Sharing: Produce, and achievement. Subjects identified the following benefits of "being:" being away, being outdoors, social interaction, community involvement, natural environment and retirement plan. Benefits which overlapped in both categories included: escape, enjoyment, stress reduction, and relaxation. It was clear from their results that both doing and being in the garden helped restore their mental acuity and focus which supported Kaplan's Attention Restoration Theory as the explanation for the improvements. As a final thought, they comment: "It is important to note, however, that the participants in this study may have attributed most benefits to the gardening itself without perceiving how the natural environment contributed to this. The effects of the natural environment may be more subtle or unconscious and therefore should not be underestimated". (p. 123).

The conclusion of a comprehensive review article examining the efficacy of ecotherapeutic techniques as complementary to more traditional forms of therapy

noted: “Despite methodological limitations, there does appear to be a growing evidence base demonstrating the physical, psychological and, to a lesser extent, social benefits of viewing, and interacting with, greenspace”. (Wilson *et al.*, 2009, p. 32).

A recent study by Passmore and Howell (2014) examined the affective wellness aspects of simply being in nature. It consisted of 84 undergraduate students at a Canadian university. 43 were assigned to the nature condition and 41 to a control condition. Those in the experimental condition were given nature tasks to complete during a two week period while the control group were given cognitive performance tasks. They were able to conclude that “ongoing nature involvement over a 2-week period boosted aspects of both hedonic and eudaimonic well-being” (p. 152) further demonstrating positive benefits of interacting with nature and lending support to ecotherapeutic interventions.

Geography/Environmental Science Research and Urban Planning

A closely allied discipline to the topic at hand is environmental psychology. In its infancy in the 70’s the main concern of the field was focused on designing pleasing environments that helped to foster positive human behaviours and discourage undesirable or anti-social behaviour. As concern with environmental issues has risen, however, the focus has shifted. As Daniel Stokols, a psychologist at the School of Social Ecology at the University of California, Irvine, shared for a recent Monitor on Psychology article: “While such topics are still of interest, Stokols says, the field has shifted to reflect modern concerns, such as ecological sustainability and public health. As we adapt our urban environments for the challenges of the 21st

century, psychologists have a particularly important role to play in making sure human nature is part of the plan". (Weir, 2013, p. 51).

As the proportion of human beings living in urban environments continues rising to all-time highs and parallels with concerns over human-produced environmental degradation, the question of the role of the constructed environments and their effect upon health and well-being of the humans has become the subject of much research.

In a comprehensive review article, van den Berg, Hartig, and Staats in 2007 analysed research relating to people's preference for nature elements even in an urbanized setting. In the section where they examine people's beliefs about the restorative power of healing, they noted that in most of the studies subjects identified stress reduction, clearing the head, getting away from civilization and time to reflect as the chief benefits of being in nature (as opposed to an urban environment.) Recounting their own research, they reported their results in which subjects felt that natural settings were more effective in bringing about psychological restoration than urban settings. Based upon their analysis, they could conclude and recommend that urban planning should include elements of nature and green spaces in order for urban residents to be able experience the psychological restoration needs and de-stress.

In a meta-analysis Professor Ian Douglas writes: "For urban people, the separation from nature is greater than in other forms of human settlement, but need not necessarily be so. Natural vegetation fulfils many ecosystem and human well-being functions in urban areas. One of the more important is alleged to be improvement in

mental health, through recovery from, or alleviation of, mental illness and stress and through helping to raise a feeling of well-being among people using natural areas". (Douglas, 2008, p. 12). He continues that his meta-analysis revealed: "There is good scientific evidence that contact with nature in urban areas can improve mental health and help in the restoration of psychological well-being". (p. 20).

The interest in the importance of human nature interactions in urban environments is not just academic, however. A recent Washington Post article concerning the High Line in New York City demonstrates how these principles are ever expanding into the popular consciousness: "The success and high profile of the High Line have served to put the practice of landscape architecture, so often overshadowed by architecture, into the limelight. The sophistication of the plant designs is undoubtedly lost on the great majority of visitors, but the effect -- of a restless, changing, naturalistic form evoking the original wildflowers -- is not". (Higgins, 2014). Similar principles are at work in the proposed Peckham Coal Line Project in London. (Peckham Coal Line, 2016).

An exciting cross-disciplinary development is in the field of urban planning. Human Geographer Jennie Middleton observed in a 2010 article, "In contrast to quantitative studies of walking as a mode of transport, the diary and interview accounts have afforded an engagement with the experiential dimensions of walking that makes apparent a range of issues with, and beyond, the dominant focus on the built environment in current pedestrian policy". (p. 591). Her research calls upon designers and planners to take into account the content of what the person

experiences as s/he travels from one place to another -- an element which has until recently gone unconsidered.

She further explores the value of these cross disciplinary approaches to expand the study of patterns of walking from merely mundane transportation concerns but also to inquire into the motivations behind walking and other sensory experiences a "walker" has such as appreciation (or lack thereof) for surroundings and considering internal mental processes, thereby overtly associating urban planning with the cognitive effects these designs can have upon the individual (Middleton, 2011). This enlightened view opens up many possibilities for future urban planning and the incorporation of green or nature elements in those plans as the psychological benefits are more fully researched and documented.

TCKs -- Third Culture Kids

The extant research in ecopsychology has mainly focused on youth (under 12 years old) and adults (19 and older), while very little work has been done with high school age students (age 15-18). Therefore, the population chosen to examine for this project was students between the ages of 16 and 18 who attended an international school and are known as Third Culture Kids (TCKs) or global nomads. Third Culture Kids is a relatively new term having originated in the 1960's. Originally, "The term 'Third Culture Kids' or TCKs was coined to refer to the children who accompany their parents into another society". (Useem, 1993). At that time the main TCKs were children of military families, missionaries and a few global business people. This definition was based upon Useem's work in cultures differing from her own over the period of two decades that then led her to examine this phenomenon on a greater

scale. In the 1960's she observed that greater and greater numbers of families were living in cultures different from where they were born -- particularly in military and missionary families -- and she noticed that they shared certain characteristics such as "the styles of life created, shared, and learned by persons who are in the process of relating their societies, or sections thereof, to each other". (Useem, 1993). While Useem's work identified a number of benefits arising from the TCK experience including a global orientation and higher participation in tertiary education, her initial work did not uncover disconnection on the whole "...(T)he majority in this study reject statements of alienation and isolation such as often feeling lonely, feeling adrift, and hesitating to make commitments to others," but she did find that "(a) number of our respondents continue to feel rootless, alienated, and unable to make commitments to people or places". (Useem, 1993).

The term TCK has been further refined a number of times so that the more widely accepted description is by Pollock and Van Reken: "An individual who, having spent a significant part of the developmental years in a culture other than the parents' culture, develops a sense of relationship to all of the cultures while not having full ownership of any. Elements from each culture are incorporated into the life experience, but the sense of belonging is in relationship to others of similar experience". (2003, p. 13).

Subsequent work over the past 20 years has identified a number of common characteristics shared by most TCKs, many of which positively contribute to their adult lives, but also a few challenges which can impede their future development and success. It must be noted, however, that these are observational and correlational

studies and do offer only valuable qualitative data. Due to the longitudinal nature of the TCKs experience, quantitative research in order to establish specific cause and effect becomes problematic.

Among some of the positive characteristics are: “TCKs gain a wealth of insight. They are tolerant of diversity, become skilled observers, and can serve as a model of multicultural principle because of their expanded world view and exposure to cultural differences”. (Gillies, 1998, p. 36).

Limberg and Lambie (2011) described four positive qualities which many TCKs exhibit including an “expanded world view, adaptable, cross-cultural relationships and often multilingual”. (p. 49). However, they also identified developmental challenges for TCKs including “identity development issues and lack (of) a sense of belonging” (p. 49) among others.

While it is clear that TCKs or global nomads develop many skills which are positive and adaptive in an ever-globalizing world, there is much research and commentary identifying challenges which TCKs face, chief among these, rootlessness and restlessness. “Often those whose parents move every two years rarely consider geography as the determining factor in what they consider home…..They may have moved so many times, lived in so many different residences, and attended so many different schools that they never had time to become attached to any”. (Pollock and VanReken, 2003, p. 121-2). With regard to restlessness later in life, “Somehow the settling down never quite happens. The present is never enough -- something always seems lacking. An unrealistic attachment to the past, or a persistent expectation that the next place will finally be home, can lead to this inner

restlessness that keeps the TCK always moving". (Pollock and Van Reken, 2003, p. 125).

Subsequent work over the past 15 years has reinforced the existence of significant feelings of rootlessness among the TCKs and on a larger scale than Useem initially found. "It is difficult to draw conclusions when there is evidence of conflicting findings. It is clear that sense of belonging is a subjective, emotional response to a place or a community of people. There is evidence that TCKs may have a multiple sense of belonging or no sense of belonging". (Fail, Thompson, and Walker, 2004, p. 326).

An early study by Gillies (1998) identified particular issues which were a challenge for TCKs. His article focused upon social and cultural norm differences that required a transition time, but that "children in the international community are prone to loneliness, because of changing friendships as people move in and out of their lives. TCKs tend to avoid solving interpersonal problems, side-stepping potential conflicts because they know the problem will 'go away.' After all, they will be moving soon". (p. 37).

Limberg and Lambie, reported in their research directed to assist school counselors of TCKs, that TCKs experience rootlessness, a lack of clear understanding of where home actually is, and a generally ongoing sense of uncertainty since everything seems to change every few years or so for them (Limberg and Lambie, 2011).

Bagnall (2012), writing with regard to strategies that international schools can adopt to assist TCKs found in his research, and reaffirmed, that “global nomads carry a challenged sense of belonging”. (Bagnall, 2012, p. 177-1).

In a paper evaluating various strategies to re-integrate the children of missionary children, Davis *et al*. found that while living abroad in other cultures afforded many unique opportunities, they also observed in their work that these same children had “feelings of rootlessness and detachment”. (Davis *et al.,* 2010, p. 186).

In a sociological self-reflection research paper, Russell (2011) recounts her own personal life history and extant research regarding TCKs experiences about being asked where she is from: “I, on the other hand, have tended to most closely align with the chameleon’s reaction to change. This is reflected in my typical avoidance of questions regarding places of origin or where I consider home, which make me stand out or seem different”. (p. 32). Her metaphor involving the comparison to a chameleon reflects her underlying understanding that her life experience differed from most of her classmates who did indeed identify with one place or culture as core to their identity (Russell, 2011).

Interestingly, Grimshaw and Sears in 2008, while discussing TCKs and global nomad children, observed that: “Some students may feel that they are more comfortable occupying the ‘third place’, which lies in between the cultural practices of ‘home’ and ‘abroad’. There, unencumbered by the associations of particular nationalities, ethnicities or other groupings, they are able to forge alternate, self-affirming identities”. (p. 262).

Other recent research has continued to reinforce the concept that individuals, when interacting with nature, do build up an affinity to the ecosystem or environment.

Scott, Amel and Manning in 2014 examined 50 participants in their research project in which their connection to nature was measured using a variety of means while they were closely interacting with and in nature for a week. They were able to conclude, “The statistically significant, positive correlations we found…...support the idea that participating in nature is related to feeling of sense of ecological connectedness”. (Scott, Amel, Manning, 2014, p. 88).

I believe that reconnecting with nature wherever that may be -- whatever nation or continent -- can be the *lingua franca* or “third place” that can help international students or TCKs reconnect with a “home”. While species may vary from place to place, the common characteristic of living flora, of trees and plants and shrubs and flowers along with rocks and streams and geographical topography could be the antidote to all of these feelings of rootlessness and disconnection. Harking back to the biophilia hypothesis, on a deeper level, the evolutionary human in each of us may be able to connect with the primordial elements as found in the elements of nature, and much as they feel as citizens of the world culturally, could connect as citizens of the natural world to help overcome the alienation so many seem to experience. This would certainly contribute an additional element to psychological health and well-being.

Specific Rationale for This Study

Original Nature/Psychological Health Literature

Modern Ecopsychology draws its inspiration and is undergirded by the groundbreaking research by Ulrich in 1984. In this study, Ulrich was curious about

the influence that a view through a window could have on recovery from a major medical procedure. In order to investigate this hypothesis, 46 patient records from a suburban Pennsylvania hospital were retrospectively obtained between 1972 and 1981 for recovery from the same surgery -- cholecystectomy. This hospital was ideally suited for this study as the patient rooms had either a view of a brick wall across a courtyard or of nature in the form of trees. Careful attention was paid in order to obtain matched pairs to compare patients with views of a brick wall or trees. "The criteria for matching were sex, age (within 5 years), being a smoker or nonsmoker, being obese or within normal weight limits, general nature of previous hospitalization, year of surgery (within 6 years), and floor level". (Ulrich, 1984, p. 420). Five pieces of information were considered for comparison regarding recovery: number of days in hospital; quantity and strength of analgesics taken; quantity and strength of tranquilizers and barbiturates taken; any complications; and any additional nurses' notes relevant to recovery. "In summary, in comparison with the wall-view group, the patients with the tree view had shorter postoperative hospital stays, had fewer negative evaluative comments from nurses, took fewer moderate and strong analgesic doses, and had slightly lower scores for minor postsurgical complications…..the results imply that hospital design and siting decisions should take into account the quality of patient window views". (Ulrich, 1984, p. 421).

No doubt Ulrich had been inspired to conduct his hospital research by Moore's earlier and narrower 1981 study of views from various prison windows. In Moore's study, the measure examined was the usage of the prison health care facilities. In this correlational study, it was found that prisoners who faced an internal courtyard

used these services significantly more often than those prisoners who had an outward facing farmland vista (Moore 1981).

Previous to the groundbreaking researching in 1984, Ulrich proposed in 1983 a theoretical explanation for the appreciation of nature based upon stress recovery emphasizing the affective restoration experienced by humans in a nature based setting. In this explanation, Ulrich examines a number of features in a natural setting (ground surface texture, deflected vistas, water, complexity, depth and man-made [sic] features) and evaluating human responses to these elements. His conclusion was that the responses transpired at the affective level and in fact were the explanation for the restoration. This theory has been described as psycho-evolutionary and identifies the experience in a natural setting as recovery from physiological stress. (Berto 2014). It has since become known as the Stress Recovery Theory (SRT).

In 1991, Ulrich, Simons, Losito, Fiorito, Miles and Zelson published the results of a research project wherein 120 undergraduate university students were shown a 10 minute black and white videotape of a distressing scenario involving workplace accidents. Each subject was then shown one of 6 different “recovery” videos consisting of two nature and four urban scenes. Physiological measurements were taken along with the Zuckerman Inventory of Personal Reactions (ZIPERS) pre and post intervention, which measure five different affective states: fear, positive affects, anger/aggression, attentiveness/interest, and sadness. Results from the ZIPERS (most relevant to the present discussion) indicated a much stronger and faster recovery in subjects after viewing the natural settings as opposed to the urban

scenes. This also held true for the physiological measures. The results from this study largely supported Ulrich's SRT explanation for improved psychological recovery from nature viewing.

In their 1989 book entitled The Experience of Nature: A Psychological Perspective, Rachel Kaplan and Stephen Kaplan presented the results of ten years of research into human attention and nature, building upon seminal work on attention conducted by William James nearly a century before. The result of this decade of extensive research was their theory called Attention Restoration Theory. While recognizing two components to attention, involuntary and voluntary or directed attention, they concluded that built environments, as opposed to nature environments, depleted the mind's ability to direct attention and that doses of nature could bring about the restoration of attention.

In an original article in 1995, Kaplan further expands upon this theory of directed attention having the following properties: "…it requires effort, plays a central role in achieving focus, is under voluntary control (at least some of the time), is susceptible to fatigue, and controls distraction through the use of inhibition….More formally, any prolonged mental effort leads to directed attention fatigue". (1995, p. 170). He further outlines the conditions necessary for a restorative nature experience which engages involuntary attention and would serve to refresh the directed attention. As a precondition, it must hold "fascination" or the ability to engage effortlessly. Further components include "being away" or the ability to physically move to a new space. Another component is that the environment must have "extent" or differing elements to contribute to the fascination. Finally, it must be compatible with what the individual

is seeking. “What one does comfortably and naturally is what is appropriate to the setting”. (Kaplan, 1995, p. 173).

Seeking to test Attention Restoration Theory, Tennessen and Cimprich in 1995 designed a study to compare the effect on attention of nature views from a college dormitory window. “If exposure to nature has a restorative effect on the capacity to direct attention, then such an effect may, at least in part, explain the beneficial effects of windows and in particular windows with a view of nature. The specific objective of this study was to determine whether the degree of naturalness in the view from college dormitory windows was associated with residents’ levels of capacity to direct attention”. (p. 78). Students were assigned to their rooms based upon seniority which introduced an element of randomness, as opposed to students having freedom of choice as to the view from their windows. Using correlational methods and a variety of measures, their results concluded that the students who had nature views were better able to direct their attention than those who had views of built elements (which included city streets, other buildings or a brick wall).

While research in this area agrees on the restorative value of nature, there are varying opinions as to the actual mechanisms of recovery, all with some degree of empirical support. These include a purely biopsychological viewpoint asserting that, because of the increasing quantity and concentration of endorphin receptors in the visual neural pathways where the colour green is perceived, the positive feelings experienced when viewing natural settings, are due to the release of these endorphins. (Sternberg, 2009). The preceding theories of SRT and ART are also presented as complementary theoretical positions, both of which agree on the

restorative value of nature, but offering different explanations for the efficacy of the restoration: SRT focusing on physiological stress while ART focuses on mental fatigue. (Berto 2014). However, tension between the two theories and their proponents can be felt, for example, in the comments by Hartig and Staats (2003) where they refer the reader to the “exchange” between Ulrich and Kaplan and Kaplan. (p. 104). In their comprehensive review article, Bratman *et al*. 2012 could cite evidence in support of both SRT and ART. Finally, Duncan and Barrett (2007) could assert from a neurobiological viewpoint that “affect is a form of cognition” thus further complicating the attribution of recovery more to SRT or ART (p. 12). Addressing this situation, Bratman *et al*. (2012) examined a third theory in addition to ART & SRT to account for the human preference for nature which focuses on an individual’s opinions and beliefs about nature and nature-like settings which directly correlates their preference for, and restoration in a natural setting.

Psychologists and researchers realize that because of the complexity of the human psyche, the underlying mechanisms to explain specific cause-effect links between certain natural elements and either positive or negative effects may be difficult to pinpoint: “Although it would be useful to understand how the visual presence of plants can have a positive effect on well-being and health, one should be open for the possibility that the natural environment influences subconscious parts of the brain in ways that cannot easily be described. Objects within the field of vision may in fact exert an influence even if the conscious brain does not recognize their existence. The classical example is the response evoked by a twig on the ground if it remotely resembles a snake: The fear is initiated prior to any visual inspection of the twig. Similarly, plants may impact on brain processes through unconscious

mechanisms even when they are not the object of focus. The absence of plants may suggest an ‘unnatural’ and thus potentially unsafe, environment”. (Grinde and Patil, 2009, p. 2334).

Wells in 2000 investigated the effect of nature upon children’s cognitive functioning as compared with the previous studies investigating attention. Focusing upon low income children and the implications of their home living environment with their cognitive functioning, she was able to examine the children’s cognitive functioning before and after they had moved house relative to the level of naturalness or “greenness” each dwelling had. She used a premove/postmove longitudinal correlational design to measure these elements and utilized a standardized Naturalness Scale which she had helped to develop. The Attention Deficit Disorders Evaluation Scale is a standardized instrument normally used for the diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) but conversely can demonstrate high level functioning among its 53 items. Her results were conclusive: “Children who experienced the most improvement (increase) in the natural elements or restorative characteristics of their home tended to have the greatest ability to direct their attention several months after moving to the new home”. (Wells, 2000, p. 790).

Rachel Kaplan in 2001 expanded her research focus beyond just Attention Restoration to general psychological benefits of a nature view. This study focused upon the adult residents of six apartment communities in the Ann Arbor Michigan area. Surveys were sent to residents who had agreed to participate based upon an earlier mailing and relied upon self-selection and self-reporting. The survey materials included a self-assessment of the view from their windows. Very detailed

descriptions were provided, as well as sample pictures representing varying degrees of built vs. nature elements. The dependent elements consisted of satisfaction with their residential environment and measures of well-being. These were self-assessed using two different questionnaires. The satisfaction scale was 14 items with a 5 point scale for each and the well-being questionnaire consisted of 16 brief descriptors to which they could respond on a 5 point scale from “never or rarely” to “frequently” and 15 adjectives to which they could respond again on a 5 point scale with “not at all” to “extremely” (Kaplan, 2001, p. 523-4). Her results found that “Nature in the window view was a strong factor in well-being and residential satisfaction” and “Views of gardens, flowers, and landscaped areas played a strong positive role in participants’ residential satisfaction with respect to both nature and neighborhood”. (p. 536). She concluded: “The findings provide considerable support for the premise that the content of the view from the window in the home setting makes a difference”. (p. 539).

A recent longitudinal study was published in which the authors sought to introduce the examination of the element of mental health over time and compared populations living in greener versus less greener urban environments. Their large study of over 10,000 subjects used data from the British Household Panel Survey 1991-2008, which had maintained its representativeness as well as providing such a large sample. The data also had the advantage of being able to look at aggregate totals as well as changes within individuals over time. General life satisfaction had been assessed via a life satisfaction questionnaire, while mental distress was measured using the standardized 12-question General Health Questionnaire (GHQ). They were able to conclude: “Our analyses suggest that individuals are happier when living in

urban areas with greater amounts of green space. Compared with when they live in areas with less green space, they show significantly lower mental distress (as indexed by GHQ scores) and significantly higher well-being (as indexed by life satisfaction ratings)". (White, Alcock, Wheeler, and Depledge, 2013, p. 926).

Berman, Jonides and (Stephen) Kaplan examined cognitive effect upon interacting with nature among university-aged students from the University of Michigan in 2008. Their study was composed of two experiments. The first consisted of the participants having their moods assessed and performing a backwards digit-span task. They were then randomly assigned to either an urban walk or walk in the Arboretum, either of which would be 50-55 minutes. Following the walk they returned and completed the same assessments. One week later they returned and did the opposite walk. Both conditions resulted in an improvement on the backwards digit-span test, but the nature walk was greater and statistically significant. For the second experiment consisting of 12 college students and also using pre/post testing using the standardized Attention Network Test (ANT) which measures three different attentional functions: alerting, orienting, and executive attention; participants were shown either pictures of nature or urban areas. Improvements were found on the executive functioning for participants who had viewed nature scenes. The response on this measure of the ANT was consistent with the results from the first experiment in that executive attention is the indicator on this instrument for directed attention.

Research conducted to date on Attention Restoration has examined many variables, but has left out a key constituency: adolescents between ages 14 and 18, as can be seen from this overview of a research article: "However attention restoration is not

just relevant for children, but has increasing relevance for adults in the current social and economic environment in which people are working longer hours and spending long periods of time looking at computer screens." (Maller *et al.*, 2008, p. 70). This is a true statement, but since the adolescent brain is in a state of growth and development, and is structured differently than either a child or an adult, research needs to target this constituency to understand if contact with nature is efficacious in the bridge period between childhood and adulthood. The present research seeks to examine this unexplored population group.

Nature Walk Research

Much foundational research has been conducted by Terry Hartig with various colleagues over the past three decades in examining various levels of nature interaction and the possible emotional and cognitive effects.

In a 1991 paper, Hartig, Mang and Evans reported on two research projects they had designed in order to examine the effect of various types of nature interventions. In the first the analysis was of the effect of backpacking trips in the wilderness on various measures of human well-being including spiritual, emotional, and cognitive. The three conditions were: wilderness holiday (N=25); non-wilderness holiday (N=18) and no holiday (N=25). In order to try to control for self-selection, particularly those who may be more receptive to wilderness holidays and therefore bias the wilderness holiday group, it was decided to only use experienced backpackers for all three conditions. All participants were university students for the quasi-experimental design. Two self-report measures were used to record affective scores and one measure of proof-reading task was used for the cognitive measure. All were

administered pre and post intervention. On one of the measures of affect, specifically regarding happiness, wilderness vacationers showed a statistically significant improvement over the other two groups. On the proofreading task, while all groups began at approximately the same level, only the wilderness holiday group improved while both of the other groups showed a decline in ability. They were able to conclude that “a prolonged wilderness experience has restorative effects”. (p. 14). For the second study, they decided to employ a true experimental design using university students from the University of California Irvine (N=34, Mean age of 20). The goal was to compare the effect of a nature walk versus an urban walk versus no walk on various indicators of emotional, cognitive and physiological well-being. Participants in the no walk group completed the experiment on the campus of UC Irvine, while subjects in the other two conditions were given driving instructions to reach the field location. In all conditions, tasks were given to induce cognitive fatigue, and baseline measures for all instruments were recorded by having the subjects complete the various instruments. The 40 minute intervention then transpired. Physiological measurements were taken after the walk or rest period. The affective measures were administered 8 minutes into the walk while the proofreading task was administered at the end of the period. For both affective and cognitive measures, the natural walk group scored better than the urban walk group who scored better than the rest group leading them to conclude “Taken in combination, the results of the present studies provide relatively strong evidence that experiences in natural settings have restorative outcomes”. (Hartig *et al.*, 1991, p. 21).

Frustrated by the lack of the precise measuring tool for their line of research, a major step forward in the ability to objectively assess the varying levels of the effectiveness

of differing environmental criteria was established by Hartig, Korpela, Evans and Gärling in 1997. In it they reported the results of four studies conducted to examine the effect of the features of the design of various restorative environments which could then be incorporated into various housing and park designs by validation through the Perceived Restorativeness Scale (PRS). “In identifying factors that work to help a person replenish resources or otherwise recover from excessive demands, research on restorative environments also points to factors that make for more supportive environments”. (Hartig, Korpela, Evans and Garling, 1997, p. 75). This cross cultural study consisted of American, Swedish and Finnish subjects. Through the use of the four different studies, the validity of the PRS instrument was established for further research into the factors that are associated with the quality of mental and psychological restoration: “In closing, a valid, reliable measure of perceived restorative quality in environments provides a way to examine the interplay of theoretical factors and the links those factors may have with specified outcomes of experiences in given settings. Such a measure also has practical value; it can be used to assess the restorative potential of existing and proposed settings, and so to inform various kinds of design efforts. The present version of the PRS is a needed attempt at such a measure, one which present studies suggest can serve the purposes just mentioned”. (Hartig *et al.,* 1997, p. 193).

Building upon the validation of the Perceived Restorativeness Scale (PRS), Hartig embarked upon examining the restorative quality of various places, this time with Korpela, Hartig, Kaiser and Fuhrer (2001). They were specifically examining the importance of place identity and place attachment and how these relate to restorativeness. “Restorative experience is an inherent potential in emotion and self-

regulation. Following negative antecedents such as stress and attentional fatigue, restorative experiences may involve positive mood change, renewal of directed attention capacity, contemplation on one's self and the like. Places that a person can rely on for restorative experiences are thus more likely to be places for which attachments develop over time and that in turn comes to figure in place identity". (p. 573). To test this hypothesis 197 college students from the University of California Berkeley were used. This was conducted in a laboratory where they were asked to envision "that one place in which you have most enjoyed spending time" and then given the PRS and open ended questions to balance both quantitative and qualitative data.

The highest rated qualities about the favorite place from the PRS were "being away," "fascination," "coherence," and "compatibility." Using frequency analysis for the open ended responses, far and away the most common characteristic was "relaxed, calm, or comfortable" at 77 times, followed by "happiness, enjoyment, or excitement" at 35 times, followed by "beauty" 29 times. The results confirmed their hypothesis regarding the restorative nature of favorite places. "Natural settings clearly predominated among favorite places and were underrepresented places. Moreover, restorative outcomes characterized natural favorite places in particular. The feelings most frequently associated with favorite places would contribute to emotional well-being -- relaxation, calmness, and comfortableness in the first place, with happiness, enjoyment and excitement as the next most frequently mentioned". (p. 586-7).

A particularly relevant piece of research was conducted by Hartig, Evans, Jamner, Davis and Gärling in 2003 examining restoration in both urban and natural settings. The heart of this experiment compared various measures of the subjects, some of

whom experienced an urban walk and some of whom experienced a nature walk. The experiment consisted of 112 college students from the University of California Irvine. The procedure involved being randomly assigned to one of four groups: Natural walk, task; natural walk, no task; urban walk, task; urban walk, no task. The task consisted of a stroop and binary exercise. The procedure was quite involved. The experiment began at the college's psychology lab in the city with the pretest procedures. They were then given instructions to drive to either their urban or natural walk location (approximately 40 minute drive). Upon arrival, they were seated in either a room with a tree view for the natural task or a viewless room for the urban task. There were physiological readings taken and the completion of three instruments: Zuckerman's Inventory of Personal Reactions (ZIPERS), the Necker Cube Pattern Control task (NCPCT) and a version of the Search and Memory task (SMT) by Smith and Miles (defined as a "test of attentional performance from the memory-loaded search task" (p.113)). The NCPCT was further administered half way through the walk and post-walk, along with the only administration of the Overall Happiness Scale (OHS). Finally, post-walk the ZIPERS and SMT were also re-administered. Of most relevance to the current discussion are the NCPCT and SMT, the two which deal with cognitive ability and nature walks. It was observed that for participants in the two nature walk conditions (task, no task), their ability to focus as measured by the NCPCT improved, while the participants in the urban walk saw their results decline halfway through the walk. The results for all groups remained stable between the midpoint measure and the posttest measure leading to the conclusion, "Apparently, the performance gap that had opened up near the halfway point in the two walks remained largely open into the postwalk period". (p. 119). The pretest-posttest SMT results showed no significant difference in performance on this

cognitive task. Overall, the results of this study led the authors to conclude: “First and foremost, our results speak to widely held beliefs that natural surroundings aid the physical and psychological restoration of people living in cities”. (p. 119). Of most relevance to the current research project, one of the two cognitive tasks showed significant improvement when comparing between all nature walk participants and all urban walk participants: “Finally, postwalk performance on the NCPCT confirmed our hypothesis of greater improvement (or a smaller decrement) in performance following the walk in the nature reserve (Hypothesis 5)”. (Hartig *et al.*, 2003, p. 122).

Staats, Kieviet and Hartig (2003) analysed subjects’ preferences of place for recovery from attentional fatigue. Using 101 students from a Dutch university, participants were randomly divided into two groups. They were then to imagine themselves as either attentionally fatigued or fully refreshed. Afterwards they viewed slides of either a nature walk or urban walk; evaluation of the possibility of recovery, reflection and social stimulation followed. And they were then shown the opposite walk slides and again asked to evaluate. The results showed a clear preference for a forest walk over the urban walk in the attentional fatigue condition. They point out that this study lends support to ART.

Staats and Hartig (2004) next turned their attention to the social aspects of walking. Using 106 students from a Dutch university, they examined 12 hypotheses regarding psychological restoration in nature vs urban settings and the social context of walking alone or in groups. Conditions participants were asked to assume for their simulated walks included either walking alone or with a friend and either attentionally fatigued or fully refreshed, they were then randomly shown slides of either a nature

walk or urban walk. Following that, the entire procedure was repeated with the other setting walk slides. As expected, those asked to assume attentional fatigue preferred the nature over the urban walk while subjects estimated more restoration with company on an urban walk over a nature walk. However, company was preferred on a nature walk for restoration if safety was an issue. A notable variable not controlled, for, however, which could possibly skew the results was the subject's preference for introversion or extraversion, which could have been a confounding variable in the latter measure.

Hartig and Staats (2006) sought to overcome a shortcoming that they identified from their own previous research which was asking the participants to assume scenarios regarding mental fatigue or not that raised the issue for them of possible demand characteristics affecting the results. To counter this, the 103 students at a Swedish university were randomly assigned to either a fatigue condition in which the procedure was performed after a day of classes or in the "less-fatigue" condition in the morning before classes had begun. Whether less-fatigued or more fatigued, both groups preferred a nature walk over the urban walk. However, the preference was larger with the more fatigued subjects which Hartig and Staats observe "owes to the more fatigued participants' more positive evaluation of attention recovery, and a greater judged likelihood of restoration when walking in the forest." (p. 215).

Hartig and Staats reviewed these three pieces of research in a chapter of the book entitled "From Landscape Research to Landscape Planning: Aspects of Integration, Education and Application," (2006) which undergird concepts key to the current research project. In their overview, they point out that these three studies sought to

evaluate subjects' attitude and preferences regarding nature vs. urban walks. A common factor in all of the studies was the use of a "simulated" walk -- meaning subjects were shown pictures of various natural and urban settings and asked to respond to the various questions. It was explained by the authors that the third study was conducted to address issues expressed after the publication of the previous two articles. The first issue raised was the possibility of the experimenter bias interfering with subjects' responses by use of repeated measures. It was pointed out that by comparing the two, subjects may have surmised that one was "better" or more preferable than another. Therefore, independent measures were used for this study. Additionally, the subjects were asked to imagine or envision being in the state of either fatigued or not in the first two experiments. The question was raised about the ability of the subjects to keep this in mind while completing all of the experiment. They commented that all previous results were confirmed: "In each experiment, we found a more positive attitude toward walking for one hour in a forest compared to a familiar city centre". (p. 289) They conclude by noting, "To some degree, our results suggest, their preferences reflect on their needs for psychological restoration, their positive evaluation of restoration outcomes, and their expectations about achieving restoration with a walk in a forest". (p. 290).

By the middle of the last decade, based on the lack of empirically based research, Pretty, Peacock, Sellens and Griffin (2005), designed a controlled experiment to gauge the effect of taking exercise traditionally or green exercise. This study involved 100 participants who ranged in age from 18-60 with a mean age of 24.6. The procedure involved the participants taking their exercise indoors, but being exposed to a variety of different outdoor settings via a set of 30 photos within each

condition. The subjects' mental health outcomes were measured using the Profile of Mood States (POMS) and the Rosenberg Self-esteem Questionnaire. Subjects were randomly assigned to one of five groups: rural pleasant, rural unpleasant, urban pleasant, urban unpleasant and control (with no pictures). The researchers were able to make some interesting conclusions. As expected, the rural pleasant scenes had a positive effect on self-esteem and subjects in that group displayed improvements in all six mood categories, though not all were statistically significant. One anomalous and unexpected result was that even participants viewing the rural unpleasant scenes produced mood improvement in three of the six mood categories. Their overall results, however, led to their finding: "We conclude that green exercise has important implications for public and environmental health". (p. 334).

The current research project has been undertaken in direct response to their concluding remarks: "Further research is now required to investigate the effects of exposure to different scenes in *real environments* (italics mine) whilst engaging in different types, durations and intensities of physical activity". (Pretty *et al.*, 2005, p. 334). Finally, De Young, in a detailed 2010 original article, suggested a specific nature intervention in the form of nature walks to improve mental vitality which was an additional theoretical inspiration for this project.

These findings were supported by Hinds and Sparks in a 2009 study. They hypothesized that the "frequency of experience of the natural environment and the degree of meaning obtained from such experience would positively predict both well-being and environmental identity". (p. 181). They examined this question using 39 graduate students from the University of Sussex in the United Kingdom and

administered two questionnaires; the first ascertained the students' assessment of their own environmental identity and the second attaching a meaning to various natural settings. Their results "support the hypothesis that environment-related identity can be related to experiences of the natural environment," (p. 184) and following on from that "Personal meaning (of the place experience) was found to be a significant predictor of affective well-being". (p. 185). This research conducted in a laboratory and inquiring of subjects' impressions and opinions sets the stage for field experimentation and achieved a notable result. "The present article gives quantitative credence to use of the natural environment for practical interventions aimed at building stronger human-environment relationships and promoting more positive well-being". (p. 185). And, following on a theme which inspires the current research project, they observe "Although the benefits of well-being of contact with the natural environment have been proposed and articulated for many years, it is only recently that these ideas and anecdotes have received empirical support in terms of quantitative findings". (p. 185).

Even in urban settings, people desire to turn to nature elements when seeking recovery from attentional fatigue. Staats, Van Gemerden and Hartig (2010), sought to examine the question of location preferences for psychological restoration among urban residents. The participants were 70 students from a Dutch university. They were randomly assigned to the antecedent condition of either attentional fatigue or no fatigue. They were then asked to express their preference for 15 scenarios ranging from extremely urban built environments to locations and activities in an urban nature park, twice: once alone and once envisioning with a close friend. Their results again supported ART in that nature, even urban nature, was preferred over

built elements for restoration. “The strong preference for relatively natural environments found in other studies hold true for *urban* nature and has important implications.” (415).

Bowler, Buyung-Ali, Knight and Pullin (2010) conducted a systematic review of published research related to the health benefits of nature interactions. Beginning with a possible 20,000 published articles using various criteria, 25 studies met the criteria for inclusion in their review. Data were synthesized from the studies and conclusions drawn. They reported that the vast majority of studies (16) focused on emotions. In general, the studies supported the propositions that after exposure to nature as compared to non-nature exposure, that there was a reduction of negative emotions such as anger, fatigue and sadness, and found some support for a positive effect on tests of attention. They raised a concern regarding the type and means of data collection: “The most common type of study outcome was self-reported measures of different emotions. Given these data were self-reported, they were therefore potentially open to bias depending on prior beliefs of the participants…..Thus it cannot be ruled out that findings may have been affected by participants’ pretest opinions/beliefs on the likely effects of a natural environment rather than any actual changes in their mental health or well-being.” (8).

Johansson, Hartig and Staats (2011) sought to examine psychological benefits of urban walks. 20 students at a Swedish university were the participants. Measures were taken regarding their affective state and a behavioral measure of attention just before and immediately following each walk. Subjects then took two urban park walks or two urban center walks over a four week period. On two of these they were

instructed to bring along a friend. Results were mixed. There was an increase in positive affect and a reduction in negative affect across both walks. There was a greater degree of “revitalisation” when walking with a friend in the urban street walk. Finally, there was a surprising result regarding cognitive benefit which is contrary to the expected result and the literature. It was expected that the urban park walk would improve cognitive ability, however cognitive ability “declined during the walk. Moreover, it declined to a greater degree with the park walk than with the walk along city streets.” (p. 274).

An alternative piece of research, Gatersleben & Andrews, 2013, responding to the calls in literature to carefully examine differing independent variables in the area of nature walk research, sought to vary the type of nature experience that subjects would be exposed to. Building upon Appleton’s Prospect-refuge theory, they chose natural environments with either “prospect” which is defined as a clear field of vision and “refuge” which is defined as containing places to hide in the visual field. For their research, they conducted two different studies. The first was a preliminary large scale study to examine the perceived strength of correlation between degree of restoration and environment. It consisted of 269 students and alumni of a university in England. They were randomly assigned to groups with varying levels of prospect: **low**, meaning a poor field of vision, many hiding places and poorly accessible; **medium**; and **high**, meaning a clear vision field, not many hiding places and very accessible. They were then exposed to photographs via an online survey exhibiting these characteristics and asked to complete it at the end of a fatiguing day. Following that, in order to measure the levels of fear, danger and restoration, “a series of one-way between-subjects analyses of variances each with 3 planned

contrasts were conducted" (p. 94). They found that subjects exposed to natural environments with high prospects and few hiding places showed lower levels of fear and higher levels of perceived restoration compared to those exposed to lower prospects and more hiding places. Due to the fact that this study only measured *perceived* restoration and that it was an online experiment, they undertook a second study.

In the second study a field experiment was conducted consisting of two walking environments: low prospect-high refuge and high prospect-low refuge settings. Its aim was solely to examine stress and mental fatigue recovery. Additionally, a laboratory component was conducted to examine actual versus simulated environments to compare the results. For both the field and the laboratory the N=17 in each. A number of measures were taken pre/post including measures of affect, attention, and physiological. All participants made two separate walks -- whether live or virtually in the laboratory after a fatiguing task. Their findings that are most relevant to the current research revealed that high prospect and low refuge settings improved concentration more than in the low prospect high refuge. (Gatersleben & Andrews, 2013). Additionally, subjects demonstrated attention recovery in the field but not in the simulated lab walks lending support to the idea that actual nature interventions can be more effective (Gatersleben & Andrews, 2013).

On a slightly different note, Holden and Mercer (2015) sought to evaluate the effect of the introduction of nature elements in a classroom on student mood and memory. Thirty-six students at a British university volunteered for the project. Twenty-one were assigned to a classroom with no nature elements ("artificial") while fifteen were assigned to a classroom containing nature elements (windows and plants). Both

rooms then received a lecture concerning archery. The subjects in the “nature infused” classroom performed significantly better on the multiple choice test immediately afterwards and one week later was still higher, though not statistically significantly; while there was no difference demonstrated in mood between the two classrooms. This suggested that nature interventions may have a time limited effect on memory and need to be repeated in order to be continually effective.

Introduction to the Study: The Problem and The Question

All of these background studies inform and undergird the current research project. As our world becomes more complicated and more technology focused, people are becoming psychologically fatigued more regularly and more deeply, (American Psychological Association 2013) and particularly so among adolescents (Pergams and Zaradic 2008). Ecopsychology has been shown to offer an effective framework in which to understand this problem and offer possible solutions. Two main theoretical approaches, SRT (Ulrich) and ART (Kaplan and Kaplan) both explored extensively above, offer complementary understandings of the ability of the mind to recover from this stress and fatigue. I chose to focus on ART as it seems more convincing in my evaluation of the extant evidence. While much research has focused on various psychological benefits of nature walk interventions, I designed my research project to extend the knowledge base by narrowing the focus, as called for in the literature.

The gaps in knowledge that became apparent were threefold: populations studied, measures employed, and perceived deficits in methodology.

Firstly, much research had been done with young children and college-age and above participants and their interactions with nature, but studies specifically focusing on 16 to 18 year old adolescents and their interactions were lacking. We know that the adolescent brain is neither still a child's, nor an adult's and therefore may not follow the known patterns of either. "There is insufficient empirical and quantitative evidence on the role of natural environment in the development of children. The role of natural environment in personal development needs more research because of existing methodological limitations, particularly nature's role in developing a sense of purpose." (Newton 2007, 32-33).

Further, research relating to the TCK subpopulation of adolescents and the influence of a natural setting on their psychological health and functioning were completely missing. An additional consideration is the nature of the focus of research in a Professional Doctorate programme. A professional doctorate programme challenges the researcher to identify and solve issues in their current work setting, as in most cases they are not a full time university graduate student. In my setting, I work with 16-18 year old students in international schools and therefore wanted to focus on an issue confronting this population and work to find a solution to it, namely the depletion of mental acuity and the use of nature to help restore it.

Additionally, few of the studies used objectively verifiable measures of state of mind or ability; most used self-reported data which are subject to criticism as being manipulable by the subjects. (Bowler *et al.*, 2010). It was noted that because Ecopsychology tends to relate more to the social science side of psychology (as opposed to the "pure science" side), published research into Ecopsychology has

been criticized for lacking hard details as found in quantitative empirical studies. “They (well-being research in nature) have contributed towards the recognition that wellbeing is a multi-dimensional state incorporating both objective and subjective components. Therefore, any attempt to explore wellbeing benefits of natural environment should capture all dimensions. Further work in this area should seek to combine both quantitative and qualitative methods to explore the wellbeing benefits of green spaces.” (Newton 2007 p.42-43). Responding to this call in the literature requires a Pragmatic approach using Mixed Methods research. Only this approach can address these concerns adequately and contribute both objectively verifiable, non-manipulable data along with the rich personal reflections which only qualitative data can provide. The full analysis of theoretical as well as methodological considerations are considered in depth in the following chapter on Methodology.

Thirdly, it was noted in the literature that most studies attempted to measure a broad spectrum of moods/skills/feelings relating to being exposed to nature but it was felt that studies designed to measure a specific outcome from the specific intervention would increase the knowledge base: “Additional points on gaps in evidence are: Quantitative information on the relative risk impacts of green space on mental health and wellbeing such that the value of psychological benefits from green space (from physical activity and visual use) can be derived”. (Newton, 2007, p. 33). Further, the report notes “It would appear that there is consensus that whilst there is a substantial amount of research investigating the broad wellbeing effects of green spaces, little is known about the impact of variation in quality of green space and variation amongst different social groups”. (Newton 2007, p. 32). The follow up comments to this

section recommend future research hone and refine exposure to nature and how the psychological outcomes would be measured.

Responding to the calls in literature for more targeted studies examining focused interventions and measuring a focused outcome, I chose to focus on one aspect of psychological health: mental acuity in the form of attention. This responds to many criticisms in the literature that studies regarding psychological benefits of nature walks attempted to measure too many variables. This is aptly summarized in the recommendations contained in a 2012 Annals of the New York Academy of Sciences report: “...there remains great scope for considering more detail in measured behavioral effects. For example, filtering tasks, complex operation span tasks, distraction tests, and other modern psychology tests may allow for examination of more detailed capabilities in the broad category of ‘attention,’” and “Isolating effects that are attributable to environmental change has been of utmost importance in recent decades for the study of population biology, climate change, and other high-profile areas in the sciences. Similar demands for rigor and specificity on the ways in which natural landscapes impact the mind may lead to exciting, compelling, and even completely unanticipated results.” (Bratman, Hamilton, and Daily, 2012, p. 132). Previous research has utilized various cognitive quantitative instruments including the Digit Span Test, Symbol Digits Modalities Test, the Necker Cube Pattern Control, a proofreading task (Bowler, 2010, p. 5) or the Stroop Test (DeYoung, 2014). The Necker is the only instrument to specifically focus on attention and my selection of the d2 Test of Attention was made to cross validate previous research on the effect on the attention aspect of mental vitality by using another validated measure of attention,

Finally, in a comprehensive review of socio-ecological approaches to mental health and well-being, Maller, Townsend, Pryor, Brown and St. Leger (2005) suggest: "Although most people are aware of the health benefits of sport and recreation, *the health and well-being benefits arising from contact with nature are little understood.* (italics mine). Further empirical research is required to remedy gaps in current knowledge, to further knowledge in this area, to facilitate decision-making and policy formulation, and to foster interdisciplinary approaches. Findings summarized in this paper warrant a repositioning of natural spaces in the minds of both the community and government". (p. 51). Maller, Townsend, St Leger, Henderson-Wilson, Pryor, Posser, and Moore in 2008 renewed this call: "Although there is much anecdotal evidence documenting the benefits of "being in nature," the exact effects (for example, by using psychophysiological measures) on the human mind, body and spirit are still largely unknown". (p. 61).

In a conference hosted by University College London in 2008 entitled "'Statins and Greenspace: Health and the Urban Environment," the following observations were made: "The scientific work reported here provides clear evidence that among many sectors of society there are positive benefits for mental health and well-being to be gained from both active and passive involvement with natural areas in towns and cities….Walking in natural areas provides opportunities for social interaction that are particularly beneficial for the elderly. Exposure to nature scenes reduces stress. Trees play an important social role in easing tensions and improving psychological health….*Nonetheless, the number of studies is limited* (emphasis mine) and almost entirely confined to the USA, Europe and Australia. They sometimes embrace

subjects of varying ethnic backgrounds, *but are often restricted to certain age groups such as students or elderly people*. (emphasis mine)" (Douglas 2008, p. 19).

While not able to address the geographical variable, it is in direct response to calls such as these that the current research project was designed to target the 16-18 year old population and add to the knowledge base using a different measure of mental acuity than previously used to give specific additional insight into the psychological effect of nature walks.

DeYoung's (2010) outline of suggested research provided the framework for the design of this study. Following the lead of Pretty *et al.* (2005) calling for research in a "real environment" the decision was made to use actual nature walks rather than asking participants to imagine they were on a walk or showing them photographs. The decision to conduct the intervention over a period of weeks was consistent with Johannson, Hartig and Staats (2011) and conducting nature walk research over a period of weeks is underrepresented in the literature.

Unique contributions to this subject and corpus of literature include:

- Focusing on an age group which has only peripherally been included in other studies (16-18 year olds).
- Focusing on a population group (TCKs) never before studied in nature walk research.
- Use of a different quantitative validation instrument for the test of attention.
- Focusing on fewer researchable conditions in one study.
- Use of personal journals to record each subject's personal impression and experience during the nature walk adds a new element to the research

literature allowing the original voice of participants to directly reach the research.

- Implications for education in terms of activities for the welfare of TCK students and beyond.

Emerging from all of this background and responding to the knowledge gaps, **the research questions thus examined are:**

To what extent do nature walks have a positive impact upon psychological health specifically cognitive attention?

How do participants describe the nature walk experience?

Previous research has not focused on changes within an individual subject's performance on various measures pre/post a specific nature walk intervention. The hypothesis, therefore, is that participants will demonstrate a measurable and statistically significant improvement (on the quantitative measure) in one aspect of cognitive functioning, that of attention, after experiencing walks in nature, in this case in a wood; and report a consonant result on the individual qualitative descriptions of the nature walk experience.

Key Terms:

Green exercise -- exercise which contains elements of nature. This can be either taking exercise in a natural environment or in the case of some studies, taking exercise indoors while exposed to visual images of nature.

Nature walk-- a walk occurring in a complete context of nature, usually a forest with no intrusions from the built environment. In some studies, “nature” may have been a non-built desert environment, based upon local conditions.

Mental acuity -- mental attention or sharpness. Typically in psychology this includes elements of memory, focus, concentration, and understanding. In the present research, one element, attention, was chosen to examine. An aspect of psychological health is mental acuity. The lack of mental acuity is seen as a deficiency in the literature leading to both physiological and psychological issues and the restoration of it is seen as healthy.

Chapter 3

Methodology

In this section, I will examine and explain my underlying rationale or philosophy of research as it relates to this project and provide details of the methodology utilized as a result of this analysis.

When one endeavours to undertake research, a necessary first step is for the researcher to consider her/his position regarding ontology and epistemology. How the researcher views these two areas will inform the type of, and approach to, research which will be undertaken. Ontology deals with the nature of reality and what exists in the world. Epistemology deals with how we apprehend that reality. As these deal with the world of ideas and concepts, they are ever-evolving. One source, for example, lists four broad categories or paradigms relating to research and ontology: positivism, interpretivism, critical theory, and realism (including critical realism) (Plant, 2005). A more recent source published just this year (2015) lists the four paradigms for research as postpositivism, constructivist, transformative, and pragmatic (Mertens, 2015), acknowledging her reliance upon Guba and Lincoln's 2005 work.The following is a brief introduction to each of the main lines of thinking within each paradigm using this most recent work (Mertens, 2015) as well as Johnson and Christensen (2010):

Postpositivism (including both positivism and postpositivism) -- These have grown out of the influence of Aristotle, Bacon, Locke, Comte, and Kant. Both positivists and postpositivists hold that only one reality exists and that a researcher can design research without involving his/her values. Positivists feel that a measure

can be made of this reality. Postpositivists feel that this one reality can be only be known partially due to the researcher's human limitations. This latter has also been described as critical realism.

The most typical research methodology would be randomized experiments using "objective" measures.

Constructivist -- This has grown from the influence of Husserl and Dilthey, among others. Constructivists will deny an objective reality and argue that reality is a social construct by individuals and that research should not try to measure objective criteria, but rather should focus on understanding the individual's apprehension of the world around them. This paradigm, therefore, relies heavily upon qualitative measures such as interviews, observations, and open-ended questionnaires. In this paradigm, the integration of the values of the researcher is seen as integral and inseparable from the research.

Transformative -- This has grown out of the Constructivist paradigm but includes "critical theorists, participatory action researchers, Marxists, feminists, racial and ethnic minorities, and persons with disabilities, among others". (Mertens, 2015, p. 21). In a way this is the constructivist paradigm, but with the purpose of explicitly aligning the researcher and research with various groups who are underrepresented, oppressed, and/or exploited. Even Mertens acknowledges this is a loosely defined grouping, but all the disparate groups have four things in common. 1. It focuses on marginalized groups. 2. It looks at why these groups have been marginalized. 3. It specifically considers the social and political forces which have led to marginalization. 4. It will use a transformative theory in the interpretation of data;

thus, perhaps critiquing the systemic assumptions underlying the underperformance of various marginalized groups, rather than the underperformance of the group itself. Therefore, this paradigm considers the cultural context of the knowledge gained while considering the power differentials in the relationships between the group being researched and various sources of authority. As with constructivism, this paradigm relies upon qualitative methodology.

Pragmatic Famous pragmatists throughout history have included William James, John Dewey and Cornel West. Pragmatists largely do not focus on the either/or nature of postpositivists and the constructivists. They acknowledge a “both/and” approach to the two and focus their research on the effectiveness of the research undertaken. So, rather than debating the nature of reality or truth, they focus on the practical nature and efficacy of the research undertaken. “According to pragmatism, what is ultimately important is what works in practice….”. (Johnson and Christensen, 2010, p. 32). Consequently, this paradigm lends itself to the use of mixed methods research, focusing on either quantitative, qualitative or a combination of the two as the situation calls for.

Paradigm Wars in Social Science

While preparing for this research project, I had to consider many factors as I developed the focus of my research question and examined these various philosophical views and their implications for research. The research paradigm must take both of these factors into account: what is being examined, and the researcher’s philosophical approach to research and his/her world view.

From the start, one is confronted by the “Paradigm Wars” in social science research

waged between two extremes -- quantitative purists and qualitative purists. These references to methodologies point to their philosophical orientations. Quantitative purists believe there is an objective world in existence which can be apprehended much the same way that physical scientists would regard their research, and whose goal is to generalize results as much as possible. Their philosophy of research would be positivist. Qualitative purists, on the other hand, do not see an objective reality but rather that there are many constructed realities which makes generalisation undesirable and usually impossible. Philosophical approaches here would include constructivists and interpretivists. (Johnson and Onwuegbuzie, 2004).

Ecopsychology as a scientific discipline is a relatively newly emerging speciality within psychology and has a philosophical divide along these same lines. Contemporary controversies within ecopsychology trace their antecedents to two disparate strands which each contributed to the modern discipline of Ecopsychology. While various individuals and publications can be identified as possible catalysts for the movement, what is indisputable is that explicit connections were starting to be made between human psychology and the environment from the 1960's. It largely arose out of the "Deep Ecology" movement, which is the philosophical inquiry into the inherent relationships between human beings and the environment. Another early influence was Robert Greenway, a prominent humanistic psychologist. Theodore Roszak formally became involved in this academic movement in 1990 (although his interest can be traced back in various writings to the 1960's also) and published in 1992, The Voice of the Earth, in which Ecopsychology started its pathway to mainstream acceptance. However, Roszak's former association with counter culture movements in the 1960's also was viewed less than favorably by mainstream academics and psychologists.

But largely because of his publication, Ecopsychology was starting to be noticed by more psychologists who felt that Ecopsychology could and should be a subdiscipline of psychology. These professionals, though, felt that Ecopsychology would need to prove its mettle by submitting its theories to scrutiny via empirical testing, much to the chagrin, if not anathema, to the early ecopsychologists (Schroll, 2007).

Modern Ecopsychology has largely preserved the tension between these two rival factions -- the early, more philosophical types who would self-identify as constructivists, while those who believe that Ecopsychology must operate as any other scientific discipline would self-identify as positivists. This philosophical division and tension, while not quite rising to the level of hostility, still dominates the philosophical discussions regarding what exactly Ecopsychology is.

Consequently, much of the published research is either qualitative and constructivist, focusing on subjective data or quantitative and positivist, dismissing the “mere opinions” of subjects which cannot be verified independently.

It is into this milieu that the current research is undertaken.

Mixed methods research, along with its philosophical underpinning of Pragmatism, is seen as a kind of *via media*. In this approach, “Mixed methods research should, instead (at this time), use a method and philosophy that attempt to fit together the insights provided by qualitative and quantitative research into a workable solution. Along these lines, we advocate consideration of the pragmatic method of the classical pragmatists (e.g., Charles Sanders Peirce, William James, and John Dewey) as a way for researchers to think about the traditional dualisms that have been debated by the purists”. (Johnson and Onwuegbuzie, 2004, p.16).

Further considerations for mixed methods research include the increasing popularity of cross disciplinary studies as well as the historical perspective that recognises that

extant methodologies can continue to preserve a predominant paradigm, thus ignoring other non-majority influences. “The pioneering work of feminists, postcolonialists, postmodernists, and critical theorists aims to expose subjugated knowledge of oppressed groups that has often been left out of or ignored in traditional research. These new paradigms look at the intersections of race, class, gender, nationality, and other hierarchical forms of social identity and often pinpoint subjugated groups as the focus of social inquiry”. (Hesse-Biber, 2010, p. 2).

Pragmatism and its methodology, Mixed Methods Research, acknowledges the value and desire, when appropriate, to utilize both quantitative and qualitative methods in the same research study, thus acknowledging the strengths of each method and that they can indeed complement one another rather than compete with one another (Povee & Roberts, 2015; Bishop, 2015).

Within Mixed Methods Research are two possible typologies: mixed model and mixed method, the former being “mixing qualitative and quantitative approaches within and across the stages of research,” while the latter “are based on the crossing of paradigm emphasis and time ordering of the quantitative and qualitative phases”. (Johnson and Onwuegbuzie, 2004, p. 19.)

My Stance

Eventually everyone must decide what philosophy of life fits for them, not just for research purposes but as a guidepost throughout life. As a result of studies and life experience, I find that I agree with elements of both positivism and constructivism. I certainly believe that there are events which, were we to be able to strip away any and all subjective filters, would be objectively verifiable. As a psychology

professional, I am also aware that the way a person represents the events in their life IS the reality for them regardless of the objective/subjective nature of these events. This contrast and controversy has been going on for centuries and is not to be resolved simply by me and my research project. That is why Pragmatism truly represents where my philosophical position lies. While acknowledging and valuing parts of both Positivism and Constructivism and acknowledging that those differences will not be bridged anytime soon, Pragmatism rather is the *via media* in declining to spend time debating between these two, but stressing a practical solution that works in the situation and not getting bogged down with an unresolvable philosophical question. So, for me Pragmatism and the use of the accompanying Mixed Methods makes perfect sense. A quantitative measure answers to my Positivist tendencies and a qualitative measure answers my Constructivist tendencies and both of them together give a more complete picture of the outcomes of the nature walk experience for the participants thus fulfilling my Pragmatist belief.

The value of Pragmatism was validated for me in the analysis of a piece of research regarding hedonic and eudaimonic well-being. (Frederickson, Grewen, Coffey, Algoe, Firestine, Arevalo, Ma and Cole, 2013). Pragmatism gave them the freedom to assess subjects from both a constructivist viewpoint and from a positivist viewpoint. Data on the subjects' experiences and opinions of life happiness was first collected and categorized as either hedonic or eudaimonic. Then a blood sample was collected and submitted for analysis regarding "leukocyte basal gene expression profiles." (p. 13684). Both the hedonic and eudaimonic states demonstrated a similar level of affective correlates. However, there was wide divergence in their microcellular level of stress hormones with the hedonic exhibiting an "up-regulated

expression of a stress-related conserved transcriptional response to adversity (CTRA)" while the eudaimonic showed a down regulated expression. This indicates that "the human genome may be more sensitive to qualitative variations in well-being than our conscious affective experiences." (p. 13684). This illustrates the value of research from the Pragmatic paradigm. Had this research been conducted from a positivist viewpoint, the physiological results would have been the same but the data could have been misinterpreted by assuming that the individuals were consciously *experiencing* more or less stress, as the case may be, which they were not. Had this research been conducted from a constructivist viewpoint, the conclusion would have been that there was no differential in effect between a hedonic and eudaimonic experience of life, which also would have been incorrect. It was only by approaching the topic from a Pragmatic viewpoint that the data could highlight the contradictory nature between the conscious experience of the individual and the underlying genomic activity.

Ecopsychology is a relatively young subdiscipline in the field of psychology and consequently is in the process of producing convincing literature to support the many theories and hypotheses which are being proposed. While much qualitative data has been collected in support of concepts and proposals, the over-reliance on this qualitative data at the expense of quantitative data has been noted in the literature. Consequently, there has been a call for experimental data which can be objectively observed. The current research project is designed to address this call for quantitative data, while providing the richness of qualitative data. Quantitative data can record observable changes in behaviours but only qualitative data can give insight into the interior processes and perceptions which each participant

experienced.

Therefore, this research project will use the Pragmatic philosophical approach and utilize a mixed-model design.

Pilot Project

One year before the final research proposal, I decided to submit my initial research proposal to a Focus Group in order to receive feedback from similar-aged students and seek evaluation in order to improve all elements of it for my final research proposal.

The Focus Group consisted of 5 recent graduates of my International Baccalaureate Higher Level Psychology class. I knew that all were well-versed in research principles, as well as ethical principles. (For background to the reader -- the LSBU Master's Level Module in Research Methods, is virtually identical to the major points of the Research Methods units which are taught in IB psychology. Therefore, even though all of these were only high school graduates, I knew that they had the knowledge to critique my research plan from a higher level of understanding than their academic credentials might suggest). Additionally this group was similar in age to the proposed subject group so could offer feedback from a potential participants' viewpoint and were familiar with the institutional peculiarities (calendar, time constraints, etc) of typical students.

They were given a document which contained the following key points and a lengthier detailed explanation:

INITIAL RESEARCH PROPOSAL

1. "Describing the student populations and observation of place

disconnectedness; relationship to Third Culture Kids theory.

2. Describing implications of place disconnectedness for psychological health.
3. Recounting research related to place disconnectedness and potential threats to academic preparedness/psychological health.
4. Recounting research related to green connectedness and potential benefits.
5. Research Question: Can integration of green exercise/connectedness improve school performance and/or psychological health?

The Focus Group (FG) was provided this document approximately two weeks before our meeting and were asked to review it. Our initial meeting took place on 15 June 2011. Students who were part of the FG had finished all coursework, taken IB exams, and had graduated, so there was no external influence upon the group to respond in any particular way. We discussed points for approximately one and a half hours. I took notes of suggested changes which arose from the group discussion. I was impressed with the quality of the suggestions made by the FG. It was clear that they had thoroughly acquainted themselves with both the theoretical and practical aspects of the proposed project as their suggestions were well thought out, cogent and valid. I found their comments extremely valuable in moving to the next stages of research and incorporated their recommendations.

FG participants had agreed to review the revisions and offer any additional input upon receiving the revision.

The following addition was made to the original document and then sent to all of the participants via email (as all had now left Switzerland to attend university.)

Changes arising from focus group feedback in June 2011:

Concerns were expressed regarding some methodology. Even though I am proposing action research which is a bit radical in that the researcher can be involved and actively advocating a change with the participants, the point was made that my research could be lent extra credibility by the addition of at least a small comparison (control) group to measure for the same criteria of the experimental condition.

Concern was expressed over the subjective nature of relying solely upon self-report instruments. Since the students were familiar with my interaction style, there is the possibility that subjects in the experimental group might demonstrate demand characteristics to “assist” the researcher. Some remedies were suggested, in addition to the original proposed evaluation tools, which included at least one “objective” measure of mental ability which is not controllable by the will (eg. a memory test, an organizational task) to supplement the self-reports and the suggestion of pre and post test measures of basic physiology (eg blood pressure and pulse)(see below). Additionally, the suggestion was made to ask the subjects to record perceived changes on an ongoing basis during the trial period, thus allowing the researcher to identify if there truly had been a pattern of change or growth, rather than a simple pre/post report.

Partially as a screening for health issues, but also in response to collecting more “objective” data, a mini physical will be administered by the school nurse, consisting of blood pressure, pulse rate and temperature pre and post. In many of the reported research pieces, there was physiological improvement as the study progressed, though not a goal in any of them.

Also, the possibility was suggested of measuring some other observable behaviour in which a second rater could be employed to validate the results by introducing inter-rater reliability.

If the group is self-selecting, a suggestion was made to screen for bias of students who already prefer nature/natural settings versus ambivalent or those who do not prefer nature at all. It is anticipated that participants will indeed be self-selected through the school's after-school programme, but that volunteering for the project would not necessarily guarantee participation. This would give the researcher the flexibility perhaps to control for this variable.

Specific valuable comments were also offered regarding our school's population. My original proposal specified either 11th or 12th graders. Students pointed out that the first semester (the time frame I am proposing) for 12th graders is the busiest of their entire school careers and therefore it would be unlikely that any could be recruited. Therefore, they recommended 11th graders only.

Also, attention was directed to the fact that the timeframe could be problematic. The original proposal was 12 weeks. As some of the measures to be examined include mental acumen and performance, there is the question of how much a student would naturally develop his/her abilities in that time frame as they are entering into the IB university preparation programme. Additionally, the issue of getting a 12 week commitment, even from 11th graders, was seen to be problematic. Therefore, the revised proposal will be for 5 weeks 2 times a week, which will fit into our school calendar, as half term occurs approximately 8 weeks after we begin, so students would know that they could volunteer for this study and be finished before that time.

The revised proposal was then sent out. All responded within one week with positive comments regarding the changes that had been suggested and incorporated into the revision. No additional modifications were suggested.

Based upon the information from the literature, there is a strong desire for those involved in Green Exercise or Ecotherapy to see more research studies replicated. There are numerous studies which support the efficacy of green interventions, but it is felt that the research is rather “thin.” To give that breadth to the research, I have included both qualitative and quantitative measures in the design. Qualitative results will allow the participants to share their motivations and interior processes and will not force them into a category which surveys and questionnaires with predetermined answers can do. However, qualitative research has its shortcomings too, not the least of which would be demand characteristics. Since there will be no deception involved with the research, participants will be fully apprised of the point of the research, thus possibly unconsciously prompting the answers the researcher is seeking on these qualitative instruments. However, much of the extant research has used these instruments, so in order to partially replicate these earlier studies, I want to include their use. My choice of personal journaling was made in order to give subjects maximum flexibility in sharing their experiences. The lack of prompts had the advantage of not directing their comments in any particular direction, while the independent recording of their thoughts and feelings was therefore not subject to demand characteristics which could occur in a one on one interview.

Quantitative results will supplement the data that the qualitative instruments collected. This would involve the measuring of physical characteristics (heart rate,

blood pressure) along with an objective test of mental acuity, most likely a proofreading task, which is not manipulable.

All measures will be taken pre and post research with the only goal of comparison within each participant rather than among group members. This is crucial as the research seeks to discover any individual improvements as a result of the Green Exercise, and not in any way to introduce a competitive element among participants.

The final point which the Focus Group assisted with was in the naming of the intervention I am proposing. As this is an emerging discipline there is no generally accepted term. There is the field of Ecotherapy, but “therapy” implies a deficit of some sort which is being overcome. This study is about improving wellness regardless of the participant’s current status, thus no “therapy” is being suggested. Therefore, we are looking solely at improving wellness and therefore need a new term to encompass these goals. The Focus Group was called upon one last time. I proposed two terms, but also solicited other suggestions: Wellness Eco Walks or Eco Walks for Wellness. The Focus Group unanimously chose “Eco Walks for Wellness” which does have a pleasing sonorous quality linguistically as well as being overtly descriptive of the intervention.

Research Project

Research Questions:

1. **To what extent do nature walks have a positive impact upon psychological health specifically cognitive attention?**
2. **How do participants describe the nature walk experience?**

Hypothesis: Nature walks will result in a statistically significant improvement in mental acuity as measured by the d2 Test of Attention and related qualitative reports.

Null Hypothesis: Nature walks will not not result in a statistically significant improvement in mental acuity as measured by the d2 Test of Attention and related qualitative reports.

Study Design

The experimental pre-test, post-test design integrating both qualitative and quantitative measures will be used. The efficacy of nature walks has already been established in the literature so this study will be designed to answer the call from previous research to examine which specific components of psychological health and well-being are affected by nature walks. To that end, one aspect of mental acuity, specifically attention, will be examined. Following a Mixed Methods design, I chose to utilize both a quantitative and a qualitative measure. The quantitative measure to be used is the d2 Test of Attention and the qualitative measure will be a personal journal where each participant could record thoughts and reflections during the period of the walks. All participants will attend a measurement session in which the d2 will be administered immediately prior to the first nature walk and also immediately following the final nature walk. They will be provided with a standard journal in which to record their thoughts and reflections during the walk period. The intervention will consist of twice-weekly nature walks over five weeks. An objective instrument could record any changes in individual functioning as a result of the nature-based intervention using repeated measures. Therefore, the manipulated variable is the nature walk interventions and the dependent variables are the test-retest scores on the d2 Test of Attention. The qualitative data would add richness

and depth to the quantitative results, giving further insight into the introspective interior impressions of each participant.

METHOD

Target Population

The target population of this research is 16-18 year old TCKs at international schools and the unit of analysis is the individual participant.

Ethics UREC Number 1262

In planning this research project, it involved low risk of harm to the participants, as the intervention was a walk in the woods near the school. To insure participant health and safety in case of any unforeseen situations, it was decided that the experimenter would accompany students on all the walks. Since it is a public woodland, the experimenter could be available to ensure participant safety.

Ethical approval was sought from the LSBU University Ethics Research Committee and was received. It was assigned UREC Number 1262. Approval was received to use the d2 as the quantitative instrument and journals as the qualitative instrument, but due to the fact that the researcher is not a medical professional, the use of physiological data as a measure to be examined for the study was not approved. However, the use of the physiological data to safeguard student health and safety was allowed.

Safeguarding participants and their information is of paramount importance in any research project. (Hesse-Biber and Leavy, 2010). Therefore, standard procedures

were followed to insure this. Informed consent was the first procedure employed to insure willing voluntary participation. This consisted of an information sheet distributed upon first demonstration of interest. If still interested 24 hours later, the researcher conferred individually with each potential participant reading through and explaining each section of the informed consent agreement. Upon receiving approval and after passing the health screening, they were admitted to the research experiment. (As explained elsewhere, the LSBU UREC approved the research project, but did not want the physiological measures included as part of the criteria measured, as the researcher is not a medical health professional.) Each participant was assigned a number so no research document (quantitative or qualitative) contains the subject's identity on it. The researcher has kept a master list apart from the original research documents to preserve the anonymity of the results at all times. Journals and test results were kept in a locked cabinet to further safeguard the information.

Provision was made for the school guidance counselor to be available should any unexpected issues surface from a participant during the nature walk research project. Physical safety was provided by the researcher being physically present along the trails while the walks took place.

Two possible issues to be aware of are demand characteristics and experimenter bias. The use of Mixed Methods design was partially to offset the possibility that the qualitative journal record keeping could be subject to demand characteristics where the participant biases their results based upon what they assume is the point of the experiment. Since there was no deception involved for this research, this was a very real possibility. The use of the non-manipulable instrument (the d2) was a cross check to this point. Experimenter bias can enter into any research project, but

particularly with the interpretation of qualitative data. The use of inductive content analysis as the preliminary stage before thematic analysis was designed in order to partially offset this concern.

After the journals were collected, care was taken to preserve the identities and the data contained therein. As mentioned above, the journals only contained their participant number and not their names. At no time was the student identity and data contained within the same document to preserve their confidentiality.

Students were debriefed following the final administration of the d2 and the collection of the personal journals. They were told that they could withdraw their results if they so desired, that if any issues surfaced that they could come back to see me and finally information was provided should they wish to see the final research product.

Participants

The subjects were 11 students enrolled in an international school in Switzerland in 11th grade which equaled 8.3% of eligible students in the class, none of whom were students directly taught by the researcher. There were 3 males and 8 females. All the students met the description of TCK, and all of whom most recently came from schools in different countries, with a mixture of different passport countries and native languages, but all of whom were proficient in English which is the language of their instruction. Countries of origin included Germany, Switzerland, France, Austria, Sweden, the Netherlands and the United Kingdom, with a variety of experiences at international schools ranging from being their first to fourth country of residence outside their home culture. The average age was 16 years 10 months with a range from 16-17.

Due to the small number of volunteer participants, it was decided to forego a control group. Had the 11 students been divided into control and “experimental” groups, it would have provided an abnormally low number of five in one group and six in the other, thus making it difficult to make any conclusions regarding the results. However, the researcher was satisfied that the total of 11 participants, which was 8.3% of the eligible members of the category of participant, was significant.

Materials

Measurements

A basic physical screening was done by the school nurse consisting of blood pressure, pulse and temperature and also to alert the researcher of any physical conditions which might prevent participation. This was not a measure of the research but a pre-screening procedure to assure the health and safety of the participants. No student had to be excluded due to this screening procedure.

Quantitative measures: To measure one aspect of the effect of nature on psychological health and wellness and mental vitality, namely mental acuity, the d2 Test of Attention was employed.

Measure of Attention: d2 Test of Attention

This instrument was originally developed for use in Switzerland and Germany as a measure for young adults’ attentional ability in preparation to receive a driver’s license, but it has subsequently been normed for English speaking subjects in recent years as well as for multiple age groups (Brickencamp and Zillmer, 1998). The d2 Test of Attention handbook explains the concepts of selective attention and mental concentration as the “continuous and focused selection of stimuli” (Brickenkamp and

Zillmer, 1998, p. 3). Further research was continued the following year to establish the construct validity of the d2 (Zillmer and Kennedy, 1999).

This measure was chosen because of its high degree of validity and reliability in assessing attention. “Results suggested that the d2 Test is an internally consistent and valid measure of visual scanning accuracy and speed.” (Bates and Lemay 2004).

An additional consideration for the d2 was that it manifests no learning effect from multiple administrations. The test has strong test-retest reliability from five hours up to 40 months which suggests that no learning effect has been observed in 28 separate research studies (Brickenkamp and Zillmer, 1998, p. 18). This means that the results pre-test vs. post-test can be attributed to the intervention and not any familiarity with the instrument itself.

The d2 Test of Attention has been used extensively in research in the medical profession (for example: Seidl, Peyrl, Nicham and Hauser, 2000; Marshall, Molle, Hallschmid, and Born, 2004; Wassenberg, Hendriksen, Hurks, Feron, Keulers, Vles, and Jolles, 2008; Porbadnigk, Gornitz, Sannelli, Binder, Braun, Kloft, and Muller, 2014), but is relatively new in Ecopsychology research, this project perhaps being the first usage. This history further demonstrates its appropriateness for this type of study. While this instrument was originally designed for 17-26 year olds, it has now been normed for older and younger age groups, which includes this study’s target population of 16-18 year olds. This standardized instrument is an objective measure of individual attention and concentration performance which are two components of mental acuity and vitality. Its validity and reliability has been established through documented research, and was developed expressly for the age range of this study,

although it has now been standardized for children and adults also.

The d2 Test involves the task of discriminating certain target symbols and crossing them out. Subjects are told to identify these characters in each line of type and only mark those. They are given 20 seconds per each line which consists of 47 items per line and 14 lines to evaluate. No other characters are to be marked through. This instrument has many subscores but the most meaningful for this research project are Total Number Processed (TN) (a measure of speed) and Concentration Performance (CP) (a measure of accuracy). Briefly, the TN "is a highly reliable and normally distributed measure of attentional allocation,…..processing speed, amount of work completed, and motivation," while the CP focus is "normally distributed, is highly reliable and provides an excellent index of the coordination of speed and accuracy of performance". (Brickenkamp and Zilmer, 1998, p. 11). Therefore, these two measures give a broad overview of mental acuity using two slightly differing criteria.

Qualitative measures:

The use of qualitative data adds richness to research data by the participants sharing the inner world of their thoughts and feelings, particularly when an intervention covers a period of time. The use of personal journals allowed maximum flexibility from the participants so they would not feel constrained to answer in any particular way as even a semi-structured interview could introduce demand characteristics. Additionally, by the participant recording their results privately and not face to face with an interviewer, the researcher would not be able to explicitly or inadvertently influence answers to various questions (experimenter bias.) Participants were told they could record their responses via word, picture or drawing -- any way which they felt accurately portrayed their lived experience during the

walks in the wood. This flexibility is the main advantage of the use of journals in research. The participants in this study are highly motivated, well-educated individuals who attend a school with a curriculum that focuses on writing and constant reflection (the International Baccalaureate curriculum), which would mean that most likely the participants would be able to fully and accurately represent in words, or pictures, or drawings, their experiences in their journals. This illustrates both the strength of this instrument as well as overcoming the main concern in the use of journals -- that participants may not have the writing ability or sophistication to utilize them to their fullest potential to achieve the research goals.

Procedure

Recruitment. Posters around school publicized the project. (Appendix I) Students voluntarily responded to a call for participants in a psychology research project involving nature walks called “Eco Walks for Wellness.” Students were given a detailed Participant Information Sheet (Appendix II) which outlined purpose, expectations and requirements. They were then given a day to further consider if they wished to participate. Subsequently, the researcher met individually with each participant and discussed the project in greater detail and explained each section of the Informed Consent Form (Appendix III), and then obtained each of their written consents. No compensation was given, but students were allowed to claim an hour-for-hour credit towards their 150-hour school requirement for action and service. The target population of this research is 16-18 year old TCKs. Students were asked to commit to twice weekly nature walks for up to 5 weeks, with consistency of participation stressed. Each student participated regularly.

Interventions

The school has public woods with nature trails within 500 meters which was utilized for the walk. It is heavily forested so when on the nature trails, only natural elements are experienced; the woods are far enough away from any highways that no noise external to the woods can be heard (see Figures 1-4).

Figures 1-4. Views of the Nature Environment.

Students were led on the walks by the researcher twice a week, immediately following the school day for one hour. This was important in that following an entire school day, the students would be in a state of cognitive fatigue, an element which was mentioned as crucial in many of the precursor studies -- making sure that the subjects were in a state of cognitive fatigue (Hartig *et al.*, 1991). Therefore, no

artificial “cognitive fatiguing” activity was employed. It was a non-strenuous walk to accommodate all students, regardless of physical fitness. A theme was proposed each of the five weeks for students to focus on while walking (e.g. noticing visual stimuli, noticing fragrances, etc.) which would encourage engagement with natural elements. Participants were asked to turn off or silence any electronic devices. The researcher purposely engaged in little conversation with students and usually maintained a physical distance between the subjects and himself, although his presence was required for health and safety considerations of the school age population.

The study was run for five weeks from September through October to take advantage of the relative warmth and sunny days in Switzerland at that time of year. Additionally, the forest was still green, as the leaves fall in Switzerland towards the end of October or November, thereby obscuring any built elements which could be visible if the trees were leafless. Students took two nature walks per week: one on Monday or Tuesday and the second on Thursday or Friday. These immediately followed the school day. The walks were from 40 to 60 minutes depending upon the pace the individual student took. While each walk began as a group, students ended up walking individually or in dyads or triads for most of the duration of the walk. For each of the five weeks, a theme was suggested for them to focus on centering on a different sense: visual, auditory, olfactory, and tactile. (Appendix IV).

At the pre-intervention administration, the researcher distributed the d2 Test of Attention answer sheet with the practice side facing upward (Appendix VI). The standardized instructions script as found in the d2 Manual was employed in the administration with no anomalies (Appendix VII). This administration gave the baseline data for each participant on the d2 for comparison after the nature walk

interventions.

Also at the pre-intervention administration, a standard journal was distributed to each participant. They were asked to record any thoughts, feelings or reflections regarding the walks and make their entries as soon after each walk as possible. It was reiterated that they could use words, pictures, drawings, etc, as each felt most comfortable.

Subsequent to the nature walk interventions, immediately following the final walk the same procedure was followed to measure their post-intervention d2 results. Each participant was debriefed and given the Debriefing Document. (Appendix V). In addition, journals were collected in the days following. Nine journals were returned for analysis, as two students chose not to record in their journals.

Results of both the quantitative and qualitative data were compiled and analysis was conducted. (Appendix VIII & IX).

Quantitative

d2 results were tabulated using the standardized procedures for scoring as found in the Test Manual.

Qualitative

Upon completion of the nature walk interventions, students returned the previously-provided journals in which they had been asked to record their thoughts and reflections immediately following or by the end of the day of each walk. Nine of eleven participants chose to record in their journals and returned them following the intervention period. The journal entries were transcribed into digital format and then inductive content analysis was employed first using the writewords.org.uk website,

and then manual interpretation of the data. Content analysis involves the analysis of text allowing the identification of themes and inductive content analysis allows themes to emerge from the text rather than deductive content analysis where the researcher is only looking for specific topics. Inductive content analysis is considered theory generating while deductive content analysis is considered theory testing (Braun and Clarke, 2006; Elo and Kyngas, 2008; Franzosi, 2008, pp. 549-563).

Results were transcribed into an electronic format for ease of analysis. Inductive content analysis was employed for this study, as mentioned above, to allow themes to emerge from the participants' own voices. Inductive content analysis introduced an objective measure into the interpretation of the data. This consisted of using word count software.

Next, the data was explored and themes were identified. There are competing and sometimes contradictory positions in the literature regarding where inductive content analysis ends and thematic analysis begins. Braun and Clarke take the position, mistaken in my opinion, that themes cannot "emerge" from the data. While they rightly call attention to the fact that experimenter bias is always a possibility, taking their position to the extreme would discount any interpretation of qualitative data as any researcher, regardless of how objective they try to be, would inject their own biases, and any theme identified could be just a projection of the researcher. However, this extreme position negates the very voice of the subjects' experiences by denying that the themes can reside in the data to be discovered by the researcher. For if the themes are not "residing" in the data collected from the subjects, where is their voice? Their only voice is contained in the words which they choose to share. Steps can be taken to minimize the experimenter bias and indeed identify the themes that do "emerge" and which "reside" in the data, for example by

using inductive content analysis in the first case.

While Braun and Clarke have the most prescriptive model of how to engage in thematic analysis, there are a variety of other models and opinions in the literature, ranging from inductive content analysis being identical to thematic analysis, “So CA and TA can be very similar/identical….:it depends on how people make sense of, and use, both of these methods.” (https://www.psych.auckland.ac.nz/en/about/our-research/research-groups/thematic-analysis/frequently-asked-questions-8.html), to differing simpler applications, to Braun and Clarke’s own admission: “Thematic analysis is a poorly demarcated and rarely-acknowledged, yet widely-used qualitative analytic method (see Boyatzis, 1998; Roulston, 2001) within and beyond psychology.” (Braun and Clarke, 2006). Therefore, the model utilized was Millward (2006) from Research Methods in Psychology. (Millward, 2006).

The results of the inductive content analysis were then used to help identify themes which emerged from the data. As noted above, this was to minimize experimenter bias in the identification of such themes. This information, taken along with reading and rereading the journals allowed the identification of the themes emerging from the subjects’ experiences during the nature walk interventions.

Taking this information and re-reading the journals paying especial attention to the most frequently used terms revealed two main themes from the participants: 1. comments noticing affective changes as a result of the nature walks, and 2. comments noticing cognitive changes as a result of the nature walks.

My role and reactions

My goal and desire in this endeavour was and is to end up helping people improve

their lives. Building from my anecdotal life experiences of the restorative power of natural settings inspired me to pursue this particular research project.

While my decision to participate on the nature walks was mainly motivated by the health and safety factor with regard to the participants, it was fortunate that that is how the procedure worked out. In spite of being the researcher on the project and overseeing the participants during the walk, I was able to feel a sense of recharge and refreshment during each of them. For me personally, I felt both stress relief and a restoration of my attention capability. While never formally diagnosed with ADD, I believe that I have exhibited those tendencies throughout my life and this experience confirmed for me the ability of nature to help soothe and calm me at the end of a particularly stressful day. It was gratifying, too, to witness this calming effect taking place in the participants as it was occurring. Because of that, the results scored and recorded by the participants were not surprising. I think my most meaningful moment, albeit anecdotal, was at the end of one of the nature walks when one of the participants who had complained of a headache at the beginning of the walk (and I had offered to let her skip the walk in case it was too much for that day) said that by the end of the walk that the headache had gone away completely. As it appeared that the participants were outwardly benefitting from the nature walks as originally conceived, no adjustment to the procedures were deemed to be necessary or desirable during the course of the research project.

When one is part of the research, sometimes results can challenge the assumptions that the researcher originally held. That was not the case here. The research rather confirmed these beliefs which further strengthened my resolve to fully implement for myself, and encourage others to benefit from, nature by immersing themselves in as much of it as they can as often as they can.

Chapter 4

Results

In this chapter I will report the results obtained from the research project. This research project employed Mixed Methods and therefore the results will need to be presented and analysed consonant with this approach. Mixed methods gives greater depth to the meaning of the results obtained by considering quantitative and qualitative results and also cross correlating these results. Therefore, the data from this research project has been subjected to the rigor of three different means of analysis. Consequently, this chapter will present firstly the analysis of two different scales from the d2 Test of Attention which was the quantitative measure. Secondly, thematic results will be presented and analysed as extracted from the individual participants' journal entries for the qualitative analysis. Thirdly, each individual participant's quantitative and qualitative results will be individually integrated to determine if the quantitative and qualitative data reinforce one another, followed by an analysis of these integrated results.

Research Question: To what extent do nature walks have a positive impact upon psychological health specifically cognitive attention?

Hypothesis H_1: Nature walks will result in a statistically significant improvement in mental acuity as measured by the d2 Test of Attention and related qualitative reports.

Null Hypothesis H_0: Nature walks will not not result in a statistically significant improvement in mental acuity as measured by the d2 Test of Attention and related qualitative reports.

Quantitative Data Analysis

Two measures of the d2 were utilized for this analysis -- the Total Number processed (TN) and the Concentration Performance (CP). The TN reflects the speed of

processing while the CP reflects the accuracy. Total Number scores can range from 215 to 652 according to the norming tables while CP scores could range between 16 and 298.

The pretest mean for TN was 511.5, with a range between 426 and 602 and the posttest mean was 578.5 with a range of 502 to 652, demonstrating a notable increase in total items completed. The pretest mean for CP was 212.2, with a range between 173 and 268 and the posttest mean was 251.7, with a range of 210 to 298, again a notable increase in accuracy of completion. As the focus of this study was only analyzing individual participant changes, group measures of variability would not be relevant.

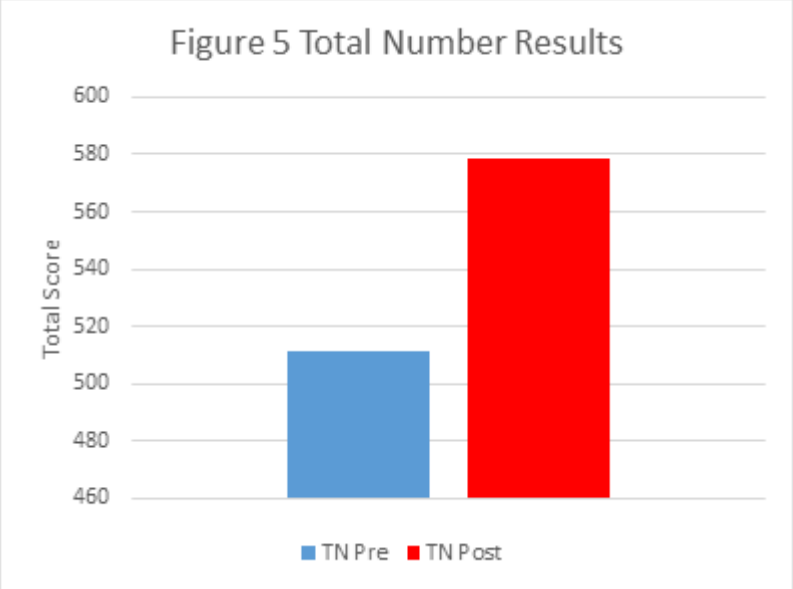

Figure 5. Total Number (TN) Pre and Post Intervention

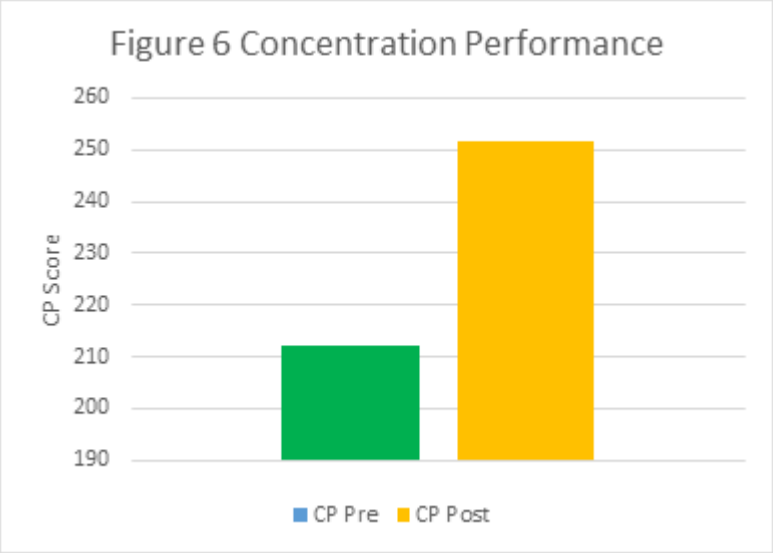

Figure 6. Concentration Performance (CP) Pre and Post Intervention

The raw data reflected an observable difference between pre nature walk and post nature walk performances on both measures. (see Appendix IX).

For the TN, ten of eleven participants demonstrated an increase in number of items completed and for the CP, ten of eleven participants demonstrated an increase in items completed accurately. In the TN, the participant who declined in total items completed, did increase their CP which indicates an improvement in accuracy post-test. In the CP, another participant increased their TN, but their CP declined which was anomalous with the rest of the group results. Upon more detailed analysis, this anomalous CP result was brought about by the participant completing fewer answers (slower speed) and committing fewer errors post vs. pre, but still because their overall total items marked through declined slightly, their CP declined, but their accuracy for items completed increased, which is not reflected in any of the subscores.

With the TN, further analysis revealed that the majority of the participants pre intervention began with a median percentile rank of the 88.5th percentile and ended

with a median of the 96.9th percentile. The only outlier scored in the 50th percentile pre and ended in 95.5th percentile post. Excluding the outlier, this means that participants began with percentile ranks between 69.2 and 99.2 and ended with percentile ranks between 81.6 and 99.9 highlighting the large improvement in spite of relatively high pre intervention results. Except for the outlier, no matter where a subject began, all ended up in the 90th to 99.7th percentile. The outlier who actually declined did not score so highly that no improvement was possible (94.5th percentile), as another participant who began at the 99.2nd percentile actually improved to the 99.7th percentile pre/post.

For the CP the median percentile rank began at the 72.6th percentile pre-intervention and ended up at the 97.7th percentile post-intervention. Three outliers here showed remarkable increases: #5 -- 34.5th percentile pre and ending with 84.1st percentile post; #9 -- 50th percentile pre and 96.4th percentile post; #8 -- 61.8th percentile pre and 97.7th percentile post. Once again, except for the outlier who declined (who was a different subject from the anomalous TN score mentioned previously), all participants ended up in the 90th to 99.9th percentile no matter where they started from, again highlighting the notable increase in this measure.

Statistical Analysis

A t-test for paired samples was used to compare the group results as this experiment employed a repeated measurement design with the participants' results compared before and after the intervention. This was calculated for both the TN and the CP, and verified using the Laerd Statistics online calculator. For the TN, the t-test for repeated measures $t=4.17$, $df=10$, $p<.001$ and for the CP, the t-test for repeated measures, $t=5.107$, $df=10$, $p<.0002$. (Appendix IX).

Therefore, based upon these quantitative results we can reject the null hypothesis (H_0) and accept the research hypothesis (H_1) that nature walks had a statistically significant positive impact upon mental acuity as measured by d2 scores. While this provided a quantitative data set to the research study, qualitative data adds the participants' individual experiences and insights while this process was occurring.

Research Question: How do participants describe the nature walk experience?

Qualitative Data Analysis

Participants were given a numbered journal and asked to record their thoughts and reflections immediately following or by the end of the day of each walk. Nine of eleven participants chose to record in their journals and returned them following the intervention period. Results were transcribed into an electronic format for ease of analysis. Inductive content analysis was employed for this study, as mentioned above, to allow themes to emerge from the participants' own voices. The use of qualitative data will add richness and depth of meaning to the results obtained from the quantitative data.

In the initial reading through all journal entries, it became clear that all participants had experienced some sort of psychological improvement which they attributed to the nature walk intervention. By having such a small sample size, individual results and nuances can be explored for each participant which would not be possible in a larger study. Examples from each journal follow here:

Participant #2:

"I observed my surroundings, the forest, the trees, some flowers and how the sunshine passed through and illuminated the leaves. It was quite beautiful. This way,

by being in such a calm environment, with no rush or anything special to do, I felt more relaxed, with less pressure and more awake."

Participant #5:

"In the woods it was beautiful and I forgot every little thing that was bothering me, I felt at peace with the whole world, but especially with myself."

Participant #6:

"Today's walk was very nice and relaxing; it was the most enjoyable walk and it was stress-releasing."

Participant # 7:

"I believe the walks provided a calm and relaxing atmosphere after such hectic days at school. It helped take my mind off things for awhile before continuing with school work. I would continue these walks as I felt 'at peace.'"

Participant #8:

"I had a busy day in school today and felt tired, almost unwilling to do the walk. Nevertheless, after the walk I seemed to feel energized again and ready to do more work. It seemed a little break from everything had helped me to concentrate better afterwards."

Participant #9:

"The walk today was enjoyable and I feel that it had an effect on my mindset. I felt calm during the walk and also afterwards. When I arrived back at school, I reflected on the walk which also helped. I look forward to the walks as it feels as if there has been a difference in my mental state afterwards."

Participant #10:

"Once again I found the walk very relaxing and felt calm after it had finished. After

the walk I also felt quite attentive and awake. I have noticed this on most of my walks. This has enabled me to work more efficiently at home."

Participant #13:

"I was distracted (in a good way) and forgot about what had been on my mind before. Everything smelt quite fresh because of the rain but it was very humid."

Participant #15:

"I always look forward to these walks now. I noticed that all the stress from school and all the work that had been building up inside of me, gradually got less, the more we walked.

I find these walks nice and calming."

More in-depth analysis was conducted using inductive content analysis. To begin with, a word frequency counter was employed and then common pronouns, verbs, common adjectives and articles were excluded. Herewith follows the frequency chart for the remaining keywords (Complete analysis in Appendix VIII):

Word	Frequency
relaxed/relaxing	27
stress/stressed/stressing	22
nature	18
relaxed	16
enjoyed	15
mind	13
woods	11
mood	10
concentrate	10
calm	10

Taking this information into account, the journals were then re-read noting particularly how these ideas/concepts/nouns/adjectives were used in sentences (positively/negatively/neutral, etc.) to give greater context to these terms and allow the identification of themes.

Two main themes emerged from the participants. All participants reported noticing either some form of affective change or cognitive change or both. Those who experienced both mentioned a simultaneous improvement in both affect and cognitive focus. These themes will be further explored below via the following specific categories.

Subtheme #1 Relaxation: (Theme of Affective Change)

Without exception, all nine participants mentioned the word relax or a variant of it in their journal entries. Some used it only once, but many of them multiple times. In all cases when it was mentioned it was in the affirmative sense of experiencing increased relaxation after the nature walks which they directly attributed to the walk in the woods. Relaxation is a complicated concept in that it can involve components both physical and mental. Usually seen as a bidirectional relationship, participants in this study as well as others, generally do not distinguish between them or report the physical and mental effects as occurring simultaneously. In addition to the examples cited in the introduction to this section, the following reflect comments regarding the theme of relaxation:

Participant #5:

"I am also more calm at home and I am able to relax more and I am starting to learn how to clear my mind also without these walks which is due to those nature walks."

Participant #8:

“Today I felt like I wanted to relax during the walk and enjoy the surrounding environment. I believe it is equally important to have fitness some days but on others just to relax and take a short break from school-life, etc.”

Participant #9:

“The walk may have subtly relaxed me, and it felt as if the relaxed mood was sustained throughout the evening.”

Participant #13:

“I felt way more relaxed than usual when we’re on the walks.”

Participant #15:

“Taking walks generally clear my mind and I find myself very relaxed afterwards.”

Subthemes #2 and #3 Stress; Mental Acuity (Themes of Affective and Cognitive Change)

Stress is a difficult concept to parse as it has both a physiological manifestation as well as a cognitive/affective component. There is no clear consensus regarding these interrelationships and stress is generally seen as having bidirectional relationships between the physiological and cognitive/affective elements. ”Most contemporary researchers believe that an adequate definition of stress must take into account the interplay between external stressors and our physical and psychological responses. This relationship is neither simple nor predictable, for it varies from person to person and from day to day.” (Parker and Ettinger, 2010). Subjects noticed conscious improvements in focus, attention and concentration or mental acuity which were noted in differing ways by different subjects as reflected in the following entries.

These four subjects reported an explicit link between the reduction of stress and their ability to concentrate and focus.

Participant #5

“Every time I come back home, I feel calmer and less stressful, I am able to concentrate and work better.”

Participant #6 (after taking the d2 for the second time):

“As for the concentration test, I did notice a difference. I think I did better on this test than on the first one…”

Participant #8:

“Nevertheless, afterwards I always find myself refreshed not only physically but mentally as well.”

Participant #15:

“Today I knew I had a lot of homework to finish after school and I felt very stressed because I really had no idea where to start. This walk was very helpful because after I had a clear mind and was therefore able to concentrate better on what I had to do. The walks are generally just helpful, because it gives me a break from school and the homework I normally do right after.”

Participant #9 explicitly connected mood, stress, and concentration. This particular subject benefited from increased mental acuity whether experiencing an improvement in mood or not. This suggests that cognitive refreshing played a role in the ability to better focus mentally.

Participant #9:

“The nature walk was also interesting as it is nice to be fully surrounded by plant life. I did not notice a dramatic change in mood, however as the evening progressed, I

found myself to feel more comfortable. Completing homework assignments also felt a lot easier."

"I was previously anxious about a maths test tomorrow, although the walk helped me to concentrate when revising."

"Today the walk was effective at improving my mood, stress levels and general well-being….The walk improved my state of mind and made me look forward to the next."

For Participant #10, while not stated explicitly, it is implied that the nature walk helped with their concentration:

Participant #10:

"Once I got home I began to revise for my biology test which is in a few days. I found revising today much easier than when I did it yesterday despite having less time than yesterday. I was able to concentrate quite well when revising and so took in a lot of information."

Integration of Quantitative and Qualitative Results by Participant

Thus far, we have examined the qualitative and quantitative data discretely. While this has value, it is also important to consider if there is correlation within each participant between the quantitative and qualitative results. So, in the following analysis, the qualitative reports will be paired with each participants' quantitative data in order to give depth of meaning and understanding to the previously identified improvement in performance from that quantitative data. The significance of these results can only be seen by an examination of each subject's results, rather than group analysis, which could dilute the significance of an individual's impressions or numerical data. Amalgamating results, as well as only reporting representative

comments, risks losing the subtlety and nuances of the participants' experiences, particularly as reflected in their qualitative comments. The following analysis, similar to a case study approach, is one of the major contributions to the literature that this study makes in that it juxtaposed completely open-ended qualitative data with quantitative data and was able to be analysed on a subject by subject basis in a real woods setting, which does not appear to have been reported in previous research. Participants' results are reported in rank order of net change on the CP, which is a better indicator of increase in mental acuity by measuring accuracy, not just speed.

Eight out of nine participants who kept a journal consciously noted some sort of improvement based upon the walks. Only Participant #13 deviated from these results: "I enjoyed the walk, but I'm not noticing any difference in how I feel on days I have the walk and days I don't." His/her quantitative data showed improvement, but s/he did not attribute this improvement to the intervention.

<u>Participant #10</u>

Pre/Post CP	212/278	Net Change +66
Pre/Post TN	509/612	Net Change +103

Participant number 10 exhibited the largest increase in CP pre/post testing and fourth highest increase in TN pre/post.

This participant not only showed the largest increase in the CP, they also noted improvement in multiple areas of psychological health and well-being over the course of the walks which included improved affect, improved mood, decreased stress, improved concentration, and even recovery from a headache during one particular walk.

This participant recorded the following thoughts:

Entry #1: “Today was the first walk. To my surprise, I quite enjoyed it, more than I thought I would. I found that walking in the forest/nature is very calming and relaxing. After a long day at school, this walk helped me to relax and to remove the anxiety and stress that I had before.”

Entry #2: “Today was the second walk. After a test, it was nice to unwind by walking through the forest.”

Entry #4: “Today was the fourth walk…..I felt very relaxed during and after the walk despite having a lot of work to do. Although I got home an hour later than I normally do, I didn’t feel stressed at all about having to do lots of homework. I just got on with it.”

Entry #5: “Once I got home I began to revise for my biology test which is in a few days. I found revising today much easier than when I did it yesterday despite having less time than yesterday. I was able to concentrate quite well when revising and so took in a lot of information.”

Entry #6: “Today was the sixth walk. During the walk I noticed that I felt quite happy and optimistic more so than at school or at home. Although, I had much to do when I got home, I knew that it would be OK so I would be able to get it all done. These problems that I often have were cleared away during the walks.”

Entry #7: “I noticed that some of the trees have begun to shed their leaves. On other trees the leaves have begun to change colour from green to yellow. I had a headache for most of the day, but after the walk I forgot about it and the pain simply went.”

Entry #8: “Today was the eighth walk. The weather was quite nice. Once again I found the walk very relaxing and felt calm after it had finished. After the walk I also

felt quite attentive and awake. I have noticed this on most of my walks. This has enabled me to work more efficiently at home."

Participant #8

Pre/Post CP	199/263	Net Change +64
Pre/Post TN	474/597	Net Change +123

Participant number eight showed the highest increase in TN pre/post testing, and the second highest increase in CP among the group.

This participant explicitly connects the walk in the wood and attributes the disconnection from the "outer world" to allow them to be "refreshed" and noticed stress relief.

Participant eight reflected on these changes throughout the intervention period:

Entry #1 (after first walk): "However, the walk did ease my mind of school and stress and let me be a bit of myself…"

Entry #4: "I enjoyed the smell of the woods we walked in, as it had previously rained, and it seemed to refresh my brain and make me more active."

Entry #6: "However, I had an urgent need to walk faster and get moving to release some built up frustration during the day. I found that afterwards I had returned to normality and was not frustrated with the experience earlier in the day."

Entry #7: "Nevertheless, afterwards I always find myself refreshed not only physically, but mentally as well."

Entry #8: "Sometimes, having time for yourself allows you to think, reflect and be detached from work to relieve stress."

Participant #16

Pre/Post CP	236/298	Net Change +62
Pre/Post TN	537/652	Net Change +115

Participant #16 had both the third highest increases in both CP and TN. Unfortunately this participant did not complete a journal.

Participant #9

Pre/Post CP	178/235	Net Change +57
Pre/Post TN	426/547	Net Change +121

Participant number nine had the fourth largest increase in CP and recorded the following thoughts.

Notable among this participant's reflection was the first walk where they noticed a delayed effect from the walk, with an appreciable improvement in both mood and focus as reflected by the ability to more easily complete homework assignments. For this participant, the theme of delayed positive outcome continued with the final entry that the "evening after the walk was also fun."

Entry #1 (after the first walk): "I found the walk to be enjoyable. It felt as if I had left behind the worries of schoolwork, etc. The nature walk was also interesting as it is nice to be fully surrounded by plant life. I did notice a dramatic change in mood, however, as the evening progressed, I found myself to feel more comfortable. Completing homework assignments also felt a lot easier. The walk may have subtly relaxed me, and it felt as if the relaxed mood was sustained throughout the evening."

Entry #3: "The walk today was enjoyable and I feel that it had an effect on my mindset...I look forward to the walks as it feels as if there has been a difference in my mental state afterwards."

Entry #4: “I feel that the walk today rid me of some stress.”

Entry #5: “Today the walk was effective at improving my mood stress levels and general well-being. I found the walk to be relaxing and entertaining. My evening after the walk was also fun…..The walk improved my state of mind and made me look forward to the next.”

Participant #6

Pre/Post CP 228/280 Net Change +52

Pre/Post TN 529/623 Net Change +94

Participant number six recorded the fifth largest increased in both CP and TN. For this participant, relaxation was the most common experienced condition as a result of the nature walks.

Entry for Day #2: “I was also able to focus on the nature more and become more relaxed than last time.”

Entry for Day #4: “This time I was more relaxed and I enjoyed the walk itself more.”

Entry for Day #7: “Today’s walk was very nice and relaxing; it was the most enjoyable walk and it was stress-releasing.”

Participant #15

Pre/Post CP 220/263 Net Change +43

Pre/Post TN 519/594 Net Change +75

Participant number 15 had the sixth largest improvement in both CP and TN.

This participant also notes the explicit connection between “clearing out” their minds during the nature walks and being able to focus and concentrate better afterwards.

Entry #1: “This was my first walk and I really enjoyed it….Taking walks generally

clears my mind and I find myself very relaxed afterwards. I also thought that walking in the countryside in the woods was very different to what I usually do which is walk in the city as I live there. I noticed that I also acted more freely in the woods than I would in a more public place."

Entry #2: "I always look forward to these walks now. I noticed that all the stress from school and all the work that had been building up inside of me, gradually goes less, the more we walked. I find these walks nice and calming."

Entry #3: "Today I was really needing this walk, as I had a lot of tests just before and I needed to 'air out'".

Entry #4: "I was acting a bit 'out of myself' today, and I sort of showed this here, jumping all over the place. The reason as to why I was able to show this is because I was in the woods, outside of town and away from school."

Entry #5: "Today I knew I had a lot of homework to finish after school and I felt very stressed because I really had no idea where to start. This walk was very helpful because after I had a clear mind and was therefore able to concentrate better on what I had to do. The walks are generally just helpful, because it gives me a break from school and the homework I normally do right after."

Entry #6: "This was my last walk today, unfortunately, and I definitely want to have the opportunity to continue a walk a week."

<u>Participant #11</u>

Pre/Post CP 201/239 Net Change +38

Pre/Post TN 484/553 Net Change +69

Participant number 11 demonstrated the seventh largest increases in both CP and TN. Unfortunately, this participant did not complete a journal.

Participant #5

Pre/Post CP 173/210 Net Change +38

Pre/Post TN 547/502 Net Change -45

Participant number five demonstrated the eighth highest improvement in CP but recorded an anomalous result in TN. While anomalous with regard to TN, their improvement in CP, which is the measure of mental acuity, does indicate a result consistent with the study's hypothesis. It appears that their experience of the walk was perceived by the participant as having a positive effect.

This participant repeatedly shares the explicit connection between experiencing nature both via visual and olfactory means and their capacity to help them relieve stress, improve emotions and even allow for being "at peace with the world."

Entry #1: "Today was the first day of our nature walks...In the woods it was beautiful and I forgot every little thing that was bothering me, I felt at peace with the whole world, but especially with myself. I loved the smell of the wood and the smell of the soil and the smell of the wet forest."

Entry #2: "The second nature walk was different than the first. I believe this is due to the fact that I am starting to know the area better. But the effect of the appearance and smell of the woods wasn't as overpowering as before On the other hand, the effect of the walk had on me remained the same. The only change was that I was able to focus more on myself and to make sure that for the time being I forget everything that I was worrying or stressing about before. An example of this was that I was very worried about the Celebration Evening and this walk helped me to re-gain a hold on my emotions and to collect myself again. To be honest, it did work…..I think that it started to have an impact on me already."

Entry #7: "To be honest, I am really surprised of all the effect just walking in the

woods had on me, the effects on my mind and my body. People say that massages help to calm down, but why spend money, when a walk in the woods can have the exact same results, maybe even better. At the same time, these walks can open the eyes to a different world in a different light and to different smells."

Participant #7

Pre/Post CP	199/224	Net Change +25
Pre/Post TN	479/528	Net Change +49

Participant number seven showed the ninth largest improvement in CP and eighth largest improvement in TN. This participant experienced an evolving opinion of their effect, from skepticism to a description of a relaxing experience.

It is interesting to note the evolution of the effects of the nature walk on this participant, beginning with the first walk where they do not notice any difference at home after the walk to the fifth entry where they directly attribute an increased sense of calm and relaxation to the nature walk.

Entry #1: "Today I went on my first psychological walk. It is hard to describe exactly how I feel. I quite enjoyed the walk as I felt care-free. I did not really think of anything stressful as I usually do when coming home from school such as homework or upcoming tests. I enjoyed seeing the greenery and wildlife as I found them interesting considering I do not usually go on nature walks. It was exciting to explore the various paths we took during the course of the walk. Even though the experience during the walk felt effective in relieving stress, I did not really feel any different to what I would have felt normally when I got home."

Entry #3: "As I go on more walks, the more I enjoy them….As the physical aspect became easier, I started noticing more around me. Despite taking the same or

similar paths on every walk, many things went unnoticed. For example I was able to observe and look out for wildlife and the different variety of plants and trees that surrounded us."

Entry #5: "I believe the walks provided a calm and relaxing atmosphere after such hectic days at school. It helped take my mind off things for awhile before continuing with school work. I would continue these walks as I felt 'at peace.'"

Participant #13

Pre/Post CP	220/226	Net Change +6
Pre/Post TN	520/527	Net Change +7

Participant number 13 recorded the 10th largest improvement in CP as well as TN. While the participant recorded a slight increase in both measures, the experience of relaxation was not very profound.

This participant reported ambivalent results on the nature walk. Early on, the participant reported more relaxation as a result of the walks, but in the 6th entry (participant only made six journal entries) said that they did not notice a difference in how they felt.

Entry #1: "I was distracted (in a good way) and forgot about what had been on my mind before. Everything smelt quite fresh because of the rain but it was very humid."

Entry #2: "I feel way more relaxed than usual when we're on the walks."

Entry #5: "I walk more slowly on these walks than when I'm walking round town, school, etc."

Entry #6: "I enjoyed the walk, but I'm not noticing any difference in how I feel on days I have the walk and days I don't."

Participant #2

Pre/Post CP	268/253	Net Change -15
Pre/Post TN	602/629	Net Change +27

Participant number two recorded the only result not consistent with the research hypothesis. The participant did increase in total number of items completed (TN), but the acuity measure (CP) declined slightly.

There is some qualitative evidence from the participant's journal that some benefit was experienced, however:

Entry #1: "Today we went for the first walk in the woods. I enjoyed it quite much, it feels good to do something like this after a long day at school."

Entry #2: "Today's walk was definitely different than last time. Today I was very tired during school, I wasn't in a good mood and felt a little homesick. During the walk I thought calmly about things, everything that made me sad, angry or happy and questioned why it was like this. I observed my surroundings, the forest, the trees, some flowers and how the sunshine passed through and illuminated the leaves. It was quite beautiful. This way, by being in such a calm environment, with no rush or anything special to do, I felt more relaxed, with less pressure and more awake."

Entry #3: "I was ill on Monday so I wasn't feeling extremely well, but I enjoyed it anyway. It's always good to take some fresh air! If not, I'm all the time inside which affects the mood."

Entry #4: "Today's walk was nice, the sun was shining but the temperature was quite cold. I thought it was relaxing because I have a maths test tomorrow so it made me think of something else and NOT school. I enjoyed the smell of the woods, very fresh and in some parts it smelled like fire which reminded me of when I used to go to the mountains when I was young."

For this participant, in spite of the contrary quantitative result, some mood improvement and relief of stress was experienced which lends support to the research hypothesis when considering the qualitative data. As with some other participants, it was noteworthy that the participant directly connected both the viewing of nature and the scent of nature as contributing to their sense of relaxation.

Analysis and Interpretation of Integrated Quantitative and Qualitative Results

As can been seen from the above sections, when considering solely the quantitative data, there was a statistically significant improvement in the group scores on the d2 Test of Attention which allowed me to reject the null hypothesis and accept the research hypothesis and conclude based upon the quantitative data that the nature walks had contributed to improved mental acuity.

Analysis of the qualitative results, the personal journals, allowed two major themes to emerge, either improvement in affective or cognitive state; and three subthemes -- the conscious experience by participants of a reduction in stress, improvement in mental acuity, and/or a general improvement in mood. In no case did a participant report an opposite reaction to any of these conditions. Only one participant noted that they did not feel either better or worse as a result of the walks, although this participant did show improvement in both cognitive scales as measured by the d2.

A major advantage to engaging in research with such a small subject pool is the ability to analyze the effect of the nature walk intervention on each subject individually, as well as the group analysis. This is usually not possible with very large subject pools where it would not be time or cost effective.

The final section, analysis by combining individual participant quantitative and

qualitative data, revealed that each subject improved in at least one quantitative measure from pre to post (or in 9 out of 11 cases, both), but that each participant explicitly connected the nature walks at some point with their ability to experience stress reduction, or improvement in cognitive acuity, or in improvement in overall mood, or a combination thereof. Therefore, rather than there being simply a correlational relationship between the nature walk interventions and improvement in some aspect of psychological health, using the journal entries where participants reflected on changes they experienced, I can safely conclude that the nature walk interventions directly impacted this improved state of mind or affect. This result is consistent with previous similar antecedent research results achieved.

SUMMARY

- In summary, the quantitative results were analyzed statistically which allowed for the null hypothesis to be rejected and the research hypothesis to be accepted.
- The analysis of the group qualitative results revealed that each participant directly attributed an improvement in mood, affect and/or mental sharpness to the nature walk interventions.
- Finally, each participant's quantitative and qualitative results were individually combined and analyzed. For 8 out of 9 participants who kept a journal, the quantitative and qualitative results mutually reinforced one another with quantitative data indicating an improvement in attention and qualitative data connecting these improvements to the nature walk experience.

Chapter 5

Discussion

This study examined the effect of a nature walk on a specific aspect of mental acuity, that of attention. The questions the researcher asked were: “To what extent do nature walks have a positive impact upon psychological health specifically cognitive attention?” and **“**how do participants describe the nature walk experience?” These questions required a Mixed Methods Approach as both quantitative and qualitative data would need to be collected in order to answer these questions. The quantitative hypothesis tested was that nature walks would result in a statistically significant improvement in mental acuity, an aspect of psychological health, as measured by the d2 Test of Attention. The quantitative data demonstrated a statistically significant increase in attention after the nature walk interventions. The qualitative data collected consisted of personal reflection journals in which subjects recorded their impressions and experiences of the nature walks as they occurred, not retrospectively. Similarly, eight out of nine participants who completed the journal concluded that there had been an improvement in some aspect of mental acuity to the nature walk intervention in their qualitative assessment journals, while all nine attributed some improvement to the nature walks at some point during the five week intervention. Thus both quantitative and qualitative data reinforced one another and were found to support the research hypothesis.

Considering the specific results obtained on the d2 Test of Attention, 10 of 11 subjects demonstrated increased mental processing speed reflected in their TN

scales. When considering their accuracy in mental processing, 10 of 11 subjects also increased their accuracy as measured by their CP scales.

Considering the results in the aggregate on both measures, the group demonstrated improved post-intervention scores that were statistically significant compared with their pre-intervention scores. Because of these results, this suggests that the nature walk intervention improved an aspect of mental acuity, that of attention, and supports the research hypothesis.

Further, the integrated data demonstrate the mutual support of the conclusion. The quantitative data gave a snapshot of performance on a cognitive task at two fixed points -- once before and once after the interventions. In this case the quantitative results can be seen as “bookends” which support the rich, more detailed verbal descriptions and impressions which the subjects experienced and recorded over the course of the five weeks of intervention.

These results contribute to theory. Firstly, the improvement in cognitive ability as recorded by the subjects’ performance on the d2 Test of Attention is consistent with, and reinforces, previous research utilizing other instruments to measure various aspects of mental acuity and supports the Attention Restoration Theory (Kaplan, 1995). Secondly, the direct attribution of this achievement (as well as improved mood and emotional state) by the subjects to the nature walks, is consistent with other research results.

But the unique features of this research include both the use of the d2 Test of Attention to measure mental acuity and the use of the personal reflection journals to record their experiences throughout the entire research period of five weeks. It is

believed to be the first use of either of these in this manner for this type of research. It appears to be the first time that the d2 has been used in nature walk research, even though it is used extensively in medical research and other psychological research. Further, it appears that this is the first use of personal reflection journals where subjects recorded their reactions throughout an entire five week intervention period, not retrospectively, or via individual interviews.

Comparison with Literature Review

The results of this study are consistent with similar studies and literature regarding the potential impact of a green intervention -- in this case a nature walk -- on one aspect of psychological health -- that of mental acuity. As this research project was designed based upon DeYoung's 2010 original article suggesting nature walks be used to help restore mental vitality and making specific suggestions of the criteria for the walks, these results can be juxtaposed with his suggestions for "many researchable issues with theoretical and practical implications" (p. 19).

His criteria included a few basic prescribed conditions. The first was "simply to walk in a natural setting." (p. 19). This was accomplished by conducting the nature walks in a nearby wood which, fortunately, were thick enough and removed enough that outside noises or built environments did not enter the participants' earshot or eyeshot during the treatment, yet near enough to the school to be accessible with only a short walk.

His second criterion included the preference to walk alone. As noted in the methodology section, small groups of students were guided on each walk for a variety of reasons including health and safety concerns. However, during most every

walk subjects either walked alone or in dyads or triads, and even then, usually engaging in relatively little conversation, much of which was directed at observing the surrounding environment which DeYoung notes: “....if the social interaction is itself engaged in noticing nearby nature, then the conversation might help both individuals to dwell more deeply in the setting and thus gain additional restoration.” (p. 19).

A third criterion was the suggestion that perception should be directed toward the surrounding natural features in order to maximize the restoration effect. This was accomplished by having a suggested theme for each walk that alternated between the various senses (see Appendix IV). As an alternative to the above, meditation while walking was also suggested as a possibility for research but since DeYoung speculates that it might be effective but for different reasons, it was felt that would be most appropriate for a separate research project.

His final point regarding the possibly disruptive effects of electronic technology during the walk was observed. All participants were asked to silence (and even turn off the vibrate feature) all electronic devices in order to disconnect from possibly the very sources of stress which the project was seeking to measure.

His final researchable question dealt with how much and how often the nature walk should occur: “More research is needed to answer this question, but findings suggest that restoration may result from exposure to very limited amounts of nature.” (p. 20). The decision to use a two-times a week for five week schedule for the subjects was based upon the researcher’s estimate of an efficacious timeframe since this was a novel investigation into these particular criteria. This was consistent with another nature walk research project which took place over a period of weeks (Johansson, Hartig and Staats, 2011) yet shorter than another study over a 10 week period

investigating aesthetic appreciation and nature walks (Diessner, Woodward, Stacy and Mobasher, 2015).

In addition to DeYoung's research, the results achieved were similar to Hartig *et al.*'s 2003 study comparing urban versus nature walks using university students. This piece of research helped establish the concepts of the content of the walk having an effect upon the subject using a variety of measures, although using differing instruments and a different population group (Hartig: university students and all Americans). The current research extended their findings in a number of significant ways: firstly, by specifically examining nature walks with a multicultural group of 16-18 year olds in Europe; secondly, working with 16-18 year olds who are TCKs and finally, using the d2 Test of Attention as the psychological instrument to measure mental acuity improvement, all novel aspects in this area of research. It is believed that this is the first project in nature walk research in Ecopsychology to utilize the d2 Test of Attention.

This study further expanded upon a number of seminal research studies which relied upon correlational measures of observing nature from various settings. Tennessen *et al.* (1995) examined the effect of the view from a college dormitory window; Wells in 2000 examined the effect on cognition of school students' views from their homes; Kaplan in 2001 examined Attention Restoration Theory of adults based upon the views from their apartment windows; and Pretty *et al.* in 2005 examined the effect of taking exercise while viewing green scenes. All of these found a benefit to those observing nature scenes but did not involve direct exposure to the nature environment. The current research advanced these concepts by immersing the subjects in an actual nature setting while attempting to demonstrate a cause and effect relationship rather than an observational/ correlational result.

Additionally, it is believed that this is the first research to specifically target, not just 16-18 year olds, which it does, but also the first to examine the effect of nature interventions with Third Culture Kids. This may seem a limited grouping to consider, but the trend in growth is continuing, meaning this population will continue to increase (Hayden and Thompson, 2008). It seems that Ecopsychology and green interventions may be able to assist in some of the attachment issues unique to these TCKs, as reflected in some participants' observations and comments.

Limitations

While this study did reveal significant results which have addressed a gap in the literature, it is important to address limitations to the study. The first limitation is the sample size. While 11 was a significant number of the population made available to the researcher (out of a possible 85 school students), this is simply not a large enough sample to make a conclusion to the general populace without further replication.

Further, due to resource limitations, this was a self-selected group. Generalizability of research is always improved by the ability to engage with randomly selected subjects. Additionally, while it was a multinational pool of subjects, they were all Western Europeans, and therefore share a level of homogeneity in culture.

While the focus was on Third Culture Kids (TCKs), a subject group not examined in any of the previous literature, it must be acknowledged that universally, TCKs tend to be students of means and therefore may not truly represent all the characteristics of their passport nationalities such as socio-economic status and cultural connection.

While the lack of a control group might prove problematic for a purely quantitative study, the same is not the case for a Mixed Methods research project. Rarely, if ever, does a qualitative study employ the use of a control group for comparison, as the purpose of a qualitative study is to understand a subject's unique perspective and internal psychological processes of the phenomenon being studied. Examining this data in this research project revealed that all subjects at some point during the nature walks intervention clearly identified a link directly between an improved mood/emotion/cognition and the nature walks themselves. Further, the quantitative results reinforced the subjects' impressions of improved cognitive ability as demonstrated in their performance results on the d2 Test of Attention. Further, the question of the efficacy of nature walks was not in question. The literature agrees that nature walks have overall positive impacts. Rather, the goal was to examine specific effects of the nature walks. To that end and in consideration of the above, a control group was not employed. However, a control group could have given a comparison to a similar population's change over the five week intervention on the quantitative measure. In this instance, though, that would have given an unacceptably smaller subject pool of 5 or 6 in the control group and only 5 or 6 in the intervention group.

Finally, the subject of confounding variables which may have served to help improve the subjects' performance on the d2 could not be controlled as the study took place over a five week period. For any research project intervention which takes place more than once, this will continue to be a challenge for future researchers. However, this concern was also partially mitigated by the use of Mixed Methods research wherein the subjects reported qualitatively during the course of the nature walk

interventions that they felt that the walks themselves were a contributing factor to their improved focus ability.

To summarize, this Mixed Methods research finding has demonstrated that subjects described and exhibited results that confirm that nature walks helped to improve restoration, not just of attention, but also other aspects of psychological health, in a population of 16-18 TCKs

Chapter 6

Conclusion

Implications for Future Research

The findings and limitations of this study indicate the need for additional research regarding the efficacy of nature walks on human psychological health and well-being. There are many directions which this research can be extended. While this was a relatively short-term intervention of only five weeks, the question arose in the researcher's mind what the least amount of treatment or intervention could be effective, as well as, if there was a point of diminishing return. For the former, an intervention of one nature walk could be the experimental condition and the mental acuity measured immediately before and immediately following. For the latter, the intervention could be extended to an entire semester or even school year to measure if there is a point of saturation, but with the added concern of confounding variables. Another suggestion for a follow up study would be to increase the sample size and improve the means of selection to include random sampling. Both of these would improve the generalizability of the results. Further, the use of a control group of similar subjects could be used to compare the changes in mental acuity and perhaps more precisely discern the change due specifically to the nature walk intervention. While a larger sample size is desirable, the most optimal situation would be the involvement of 16-18 year old students from differing backgrounds and cultures, including those from more collectivist and less Western individualist cultures. Further diversity in the sample size on many levels would make the results even more generalizable -- this would include socio-economic background, education level, and ethnicity.

Additional research into mental acuity could utilize measurements of the other aspects of acuity: memory, focus, concentration and understanding, but still examining only one of these at a time to answer the calls in research to have more directed quantitative research in order to attempt to establish specific cause and effect.

All of the above deal with measurements of the effect on mental acuity, but there is an entire other realm of measuring the nature walk impact upon the affective side of human personality. While the intervention (nature walk) would be similar, the measurements would focus on the emotions and feelings, rather than on the cognitive processes. In order to answer the call in literature for more objective data to supplement the qualitative data, physiological or observational measures could supplement the more subjective questionnaires or journals of participants.

Practical Implications

These results support the introduction of green interventions into a school curriculum in order to improve psychological health and well-being. Just as pressures are mounting for adults in the world, pressures are also mounting for students as high stakes testing encroach further and further into the school curriculum, in many different places. Additionally, while technology has improved many aspects of education, it has also introduced additional stressors for children such as cyberbullying. Therefore, green interventions could be implemented to help to ameliorate these negatives. These interventions could take many different forms depending upon the setting and resources available to each school.

In my working with high school students, the results gave impetus into a continuing after-school Eco Walks for Wellness programme in which students chose to participate. Based upon the demonstrated results, students were able to have a brief mental recharge time to refocus and escape the built environment which helped them restore mental vitality and improve their psychological well-being.

It is recommended that high schools adopt, to the extent possible, but recognizing possible limitations due to their geographical settings, a similar programme which will have obvious benefits to their student populations, namely a chance for them to mentally re-charge and re-set -- to re-focus their attention, on a regular basis. If the nearest natural greenspace is not within a practicable distance, a regular outing should be considered to become part of the student wellness plan. Finally, as schools are being developed, planned or renovated, provision should be made for adequate and appropriate greenspace. This could consist of the simplest collection of shrubbery and trees to more elaborate greenspaces allowing for students to meet and congregate.

Additionally, building upon the results from this as well as the previously cited studies, the introduction of nature scenes should be considered in urban school environments which lack any access to natural green space. While not a substitute for an actual nature experience, the direction of research in this area indicates that even in simply viewing representations of nature, subjects may show improvement in aspects of psychological focus and health.

Imperfect an analogy as it is, periodically our computers need to be shut down down to clear out their RAM (random access memory); similarly, the human brain needs to be able to switch off, clear out, and refresh. Sleep accomplishes some of this re-setting; nature walks are a positive way to benefit students during their waking hours, however. As evidenced by this research as well as the growing body of literature, nature contact facilitates this recovery and thereby contributes to a student's mental vitality.

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APPENDIX I
PUBLICITY POSTER

After School Nature Walks

Eco Walks for Wellness

10 CAS Hours available

In the style of the Aesch campus Waldkinder programme, you can have the opportunity to participate in the initial group to evaluate if nature walks can help improve your psychological health and well-being among high school aged students!

What/when: One hour "Eco Walks for Wellness" on the nature trails behind the Reinach campus twice a week for 5 weeks after school between now and October break. Plus the opportunity to participate in a real academic research study!

FMI see Mr. Bowen or email him at markfbowen@hotmail.com

APPENDIX II
Initial Information Sheet

Nature Walk Research Project

"Eco Walks for Wellness" is a research project which is seeking to investigate the effect of nature walks on various measures of psychological well-being. This is NOT a therapeutic intervention, but rather a complementary approach which proposes that being exposed to nature via nature walks can help to reduce stress, improve self-esteem, mental acuity, and mood.

Research on this topic dates back to 1984 with the publication of a study in which hospital patients who had a view of nature from their rooms recovered better than those who had only a view of the parking lot.

You are being asked to commit 11 hours of your time. 10 hours will be in the form of one hour nature walks or "Eco Walks for Wellness" two times a week for five weeks from now until October break and keep a journal recording your thoughts and feelings about the Walks. The other hour is ½ hour of filling out one instrument regarding mental acuity before the nature walks and ½ hour after five weeks **for comparison purposes only. These are NOT to diagnose you for any condition**. The walks will take place on the nature trails adjacent to the Reinach campus.

This is an extracurricular activity run by Mr. Bowen independent of the ISB, however Fr. Jaehde has confirmed that you will be able to receive 10 hours of "Action" credit toward your CAS requirement.

If you choose to participate, you will receive a full information briefing and need to grant your consent; your individual data will remain confidential; you will be able to stop at any time you would like to; and you will have the opportunity to review the results upon completion of the project.

APPENDIX III
INFORMED CONSENT FORM

Title of Study: To What Extent Do "Green" Interventions Improve Psychological Health and Well-Being?

Principal Investigator:

Mark Bowen
Department of Education
London South Bank University
+41 61 331 0961
markfbowen@hotmail.com; markbowen@lsbu.ac.uk

Background:
You are being invited to take part in a research study which has been approved by the London South Bank University as part of a doctoral research programme. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. Please take the time to read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information.

The purpose of this study is to investigate if green interventions in the form of nature walks will help improve psychological outlook using a number of methods.

Study Procedure:
Your expected time commitment for this study is: 11 hours.
Before the first nature walk, you will be asked to complete 1 very short assessment of mental acuity. Your temperature, blood pressure and pulse will be taken by the nurse to insure your healthiness for the study.
You will then have two 1-hour nature walks per week for 5 weeks. You will be asked to keep a detailed journal recording your thought processes, feelings, etc. during the nature walk and reflecting upon them afterwards. You can use words, pictures, drawings, etc as you feel moved.
Following the last one you will be asked to complete the same assessment and have your blood pressure, pulse and temperature taken. You will be asked to turn in your journal and to discuss points of significance you found. Following a short debriefing, you will be released from the research study. You are entitled to see your results as well as the overall research conclusions by contacting me at the above email address.
Including debriefing, your participation should last no more than 7 weeks (5 weeks walking, 2 weeks for follow-up.)

Risks:
The risks of this study are minimal. These risks are similar to those you experience when you are disclosing personal information to others; however, the confidentiality of your data is assured. You may decline to answer any or all questions and you may terminate your involvement at any time if you choose. The physical measurements are non-obtrusive and low stress, the measure of acuity was originally designed for 16-18 year olds applying for a driver's license in Switzerland or German and so is appropriate, and the interviews will only ask for your reflections and be non-confrontational, and therefore low stress.

Benefits:
There will be no material benefit to you; however, if the hypothesis is correct you may experience improved mood and outlook. This research may benefit other people by helping us to know if activities like this can improve these dimensions.

Confidentiality:
Every effort will be undertaken by the researcher to preserve your confidentiality including the following:

- Assigning code numbers for participants that will be used on all researcher notes and documents.
- Notes, interview transcriptions and transcribed notes and any other identifying participant information will be kept in a locked file cabinet in the personal possession of the researcher. When no longer necessary for research, all materials will be destroyed.
- The researcher and members of the researcher's committee will review the researcher's collected data. Information from this research will be used solely for the purpose of this study and any publications that may result from this study. All participants in this study will not be identified and their anonymity maintained.

Person to Contact:
Should you have any questions about the research or any related matters, please contact the researcher at the above phone number or email.

Institutional Review Board:
If you have questions regarding your rights as a research subject, or if problems arise which you do not feel you can discuss with the Investigator, please contact his Supervisor, Stephen Lerman at lermans@lsbu.ac.uk, or Joan Curzio of the London South Bank University Research Ethics Committee at: curziojl@lsbu.ac.uk.

Voluntary Participation:
Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. If you decide to take part in this study, you are still free to withdraw at any time and without giving a reason and your records would be destroyed at that point. You are free to not answer any question or questions if you choose. This will not affect the relationship you have with the researcher.

Unforeseeable Risks:
There may be risks that are not anticipated. However the activity is no different than undertaking a walk in the woods and every effort will be made to minimize any risks.

Costs to Subject:
There are no costs to you for your participation in this study.

Compensation:
There is no monetary compensation to you for your participation in this study, but you will be allowed to claim 10 hours of Action for your Creativity, Action, Service requirement at ISB.

Consent:

By signing the consent form, I confirm that I have read and understood the information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Participant Signature _____ Date _____
Researcher Signature _____Date _____
(Copy to participant)

Summary Provisions:

10 one-hour nature walks spread over 5 weeks.
Up to two weeks more for follow up information.
You will be asked to record your thoughts and feelings concerning the Nature Walks throughout in a journal to be provided.
Confidentiality of Data Assured via numbering system.
You have the Right to Withdraw at any point with no consequence.
Including debriefing, your participation should last no more than 7 weeks (5 weeks walking, 2 weeks for follow-up.)

APPENDIX IV
WEEKLY THEME HANDOUTS

WEEK 1

Welcome to Eco Walks for Wellness!

The goal of our journeys on Eco Walks for Wellness is to both physically and mentally leave the everyday behind. So to foster this goal, for just one hour during our time together, please turn off all electrical equipment. On our Walks, try to focus on the natural elements around you. This is not a silent walk by any means, but try and refrain from rehashing the day or planning for tonight; if possible discuss elements of nature you see around you. For each walk, I will provide you with some points to ponder (NOT questions to answer!) regarding the natural world around you. This exercise builds upon existing research which has demonstrated the positive influence that nature can have on our stress levels and psychological health and well-being

Today and this week, why not focus on the visual elements around you? What colours are you seeing? What shapes are you seeing? Are there different species of plants? What is pleasant to you? Is there anything unpleasant to view? Why do you think that is? Do these sights bring to mind any associations or memories?

WEEK 2

This week's walk theme

Why not take notice of the sounds you hear?

What do you notice?

Is it quieter than you are accustomed to?

How is this different than a walk in a more urban setting?

Do you notice the sound of your own footsteps?

WEEK 3

Today's walk theme

Why not take notice of the temperature today?

Do you feel a noticeable change in temperature?

Do you notice the shade areas?

Do you like feeling the warmth/chill of the woods?

Does the temperature affect any of the scents or fragrances (or odours) in the forest?

WEEK 4

Thought for the day:

Why not focus on the scents, fragrances or even odours you experience on the walk?

Are they the same as you experience in everyday life?

Are they different?

How?

Do you like them?

WEEK 5

FINAL WEEK THEME

Focus on the all of the surrounding natural elements and their impact upon you.

Sometimes focusing on one might be best for you and sometimes focusing on all of them combined might be best; it's up to you!

Have you noticed any changes by taking the afternoon walks?

APPENDIX V
Debriefing Document

TO WHAT EXTENT DO "GREEN" INTERVENTIONS IMPROVE PSYCHOLOGICAL HEALTH AND WELL-BEING
DEBRIEFING FORM

1. PURPOSE OF THE STUDY

The study in which you just participated was designed to identify the psychological benefits of Eco Walks for Wellness.

2. METHODOLOGY

In this study you were asked to take nature walks (Eco Walks) twice a week for five weeks and record your thoughts and reflections in journals. Additionally you participated in an objective measure of mental acuity (the d2) pre and post walk.

3. ADDITIONAL RESOURCES

For more information on the topic of this research, there are two key studies you could review:

PRETTY, J., GRIFFIN, M., SELLENS, M. and PRETTY, C., 2003. *Green Exercise: Complementary Roles of Nature, Exercise and Diet in Physical and Emotional Well-Being and Implications for Public Health Policy.* CES Occasional Paper 2003-1. Colchester, UK: University of Essex.

DEYOUNG, R., 2010. Restoring Mental Vitality in an Endangered World: Reflections on the Benefits of Walking. *Ecopsychology,* **2**(1), pp. 13-22.

4. CONTACT INFORMATION

If you are interested in learning more about the research being conducted, or the results of the research of which you were a part, please do not hesitate to contact the Principal Investigator, Mark Bowen at markfbowen@hotmail.com or his principal supervisor, Stephen Lerman at lermans@lsbu.ac.uk.

Thank you for your help and participation in this study.

Name: _____

Age: _____ Sex: ☐ male ☐ female

Handedness: ☐ L ☐ R

Years of education: _____

Occupation: _____

d2 Test of Attention

Rolf Brickenkamp & Eric A. Zillmer

Examiner: _____ Date: _____

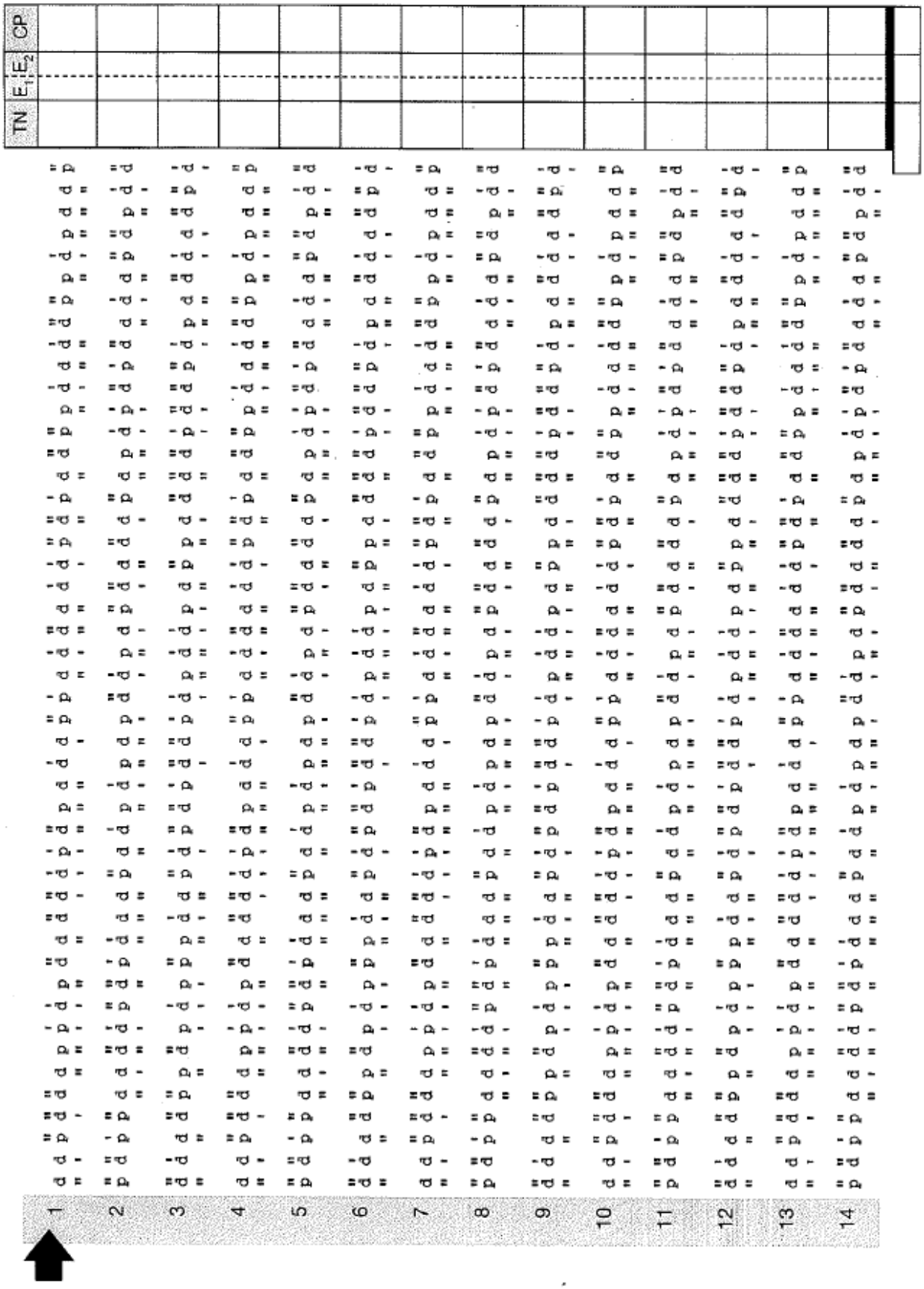
Example: d d d

Practice line:

d	p	d	d	d	d	p	d	d	p	d	d	d	d	p	p	d	d	p	d	d
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

	Raw Score	Percentage	Percentile Rank	Standard Score
TN (total number)				
Omissions: E1				
Commissions: E2				
E (errors)				
TN-E (total-errors)				
CP(concentration performance)				
FR (fluctuation rate)				

S-Syndrome: ☐



APPENDIX VII
d2 Instructions

Administration

Test Material

The current edition of the d2 Test contains the following materials:

- Manual
- Recording blanks
- Two scoring keys

In addition, two soft pencils (without erasers) per subject and a stop watch or timer for the examiner are required. For group administration, especially with children, demonstrating the test beforehand at a blackboard or on a chart is recommended. A calculator may be useful for analyzing some of the data.

The manual contains the instructions for administration, scoring and interpretation, and documents salient statistical research to date on the extent to which the d2 Test fulfills standard test criteria.

The front page of the recording blank is reserved for recording the subject's personal data and performance results. In addition, there is a line for practicing so that the subject can become acquainted with the task. On the reverse page is the standardized test form in a landscape layout of 14 test lines with 47 characters in each line. There are 16 different types of characters, each consisting of a letter "d" or "p" marked with one, two, three or four small dashes. During the test, the subject has to scan the lines to identify and cross out all occurrences of the letter "d" with two dashes while ignoring the other characters as irrelevant. The frequency of relevant "d's" to irrelevant characters is ca. 1:1.2.

Scoring keys are printed with scales (from 1 to 47) on their upper and lower edges for counting the number of characters processed on each line (and thus each identical unit of time). The first scoring key serves for finding errors of omission (Type E_1) while the second key helps to locate errors of commission (or confusion) (E_2). The blank spaces on the first key are numbered for each line separately, so as to facilitate scoring.

Administration Guidelines

Basic guidelines for administration psychological tests in general hold for the administration of the d2 Test. The room should be brightly illuminated without blinding effects, warm but not overly heated, and free of noise. All forms of disturbance, for example telephone calls, must be avoided.

A set time of day for taking the test is not necessary, since no significant circadian effects of performance on the d2 Test have been observed. It has proven useful, however, to plan administration of the d2 Test early in the course of an investigation to permit time for repeating the test if it is deemed useful.

Before the test is administered, subjects who require glasses for reading should be reminded to bring them along. Significant problems with visual acuity and/or illiteracy are reasons to exclude subjects from the examination with the d2 Test.

Standard Instructions for Adults

Each subject receives a recording blank with the front page on top and two soft pencils without erasers; the second pencil to be held in reserve in case the first one becomes broken. When the recording blanks have been handed out, the examiner briefly explains the general purpose of the test in words such as:

"With the help of the following task, I would like to see how well each of you can concentrate on a particular assignment."

Then the participants are asked to fill in their name, age, sex, handedness, years of education, and occupation. When they are finished the examiner continues with:

"Please pay attention. After the word 'Examples' on your recording blank you see three small letters marked with dashes. These are the letter 'd' as in 'dog,' and each is marked with two dashes. The first 'd' has two dashes on the ~~bottom~~, the second has two on the bottom, and the third 'd' has one dash

on the top and one on the bottom, still making two dashes all together. I would like you to cross out every letter 'd' that has two dashes by making a single line through the letter. Try doing this first with the three examples, then try the practice line. You are not supposed to cross out the other letters. Thus, a 'd' which has more than two or fewer than two dashes should not be crossed out, and the letter 'p' as in 'pig' should never be crossed out, no matter how many dashes it has. Do you have any questions right now?"

These instructions can be repeated, abbreviated or expanded, as long as the meaning is kept basically the same. They can be augmented with further examples on the blackboard or modified to correspond to different levels of comprehension among subjects. If the examiner keeps to the exact wording, speaking slowly and clearly, there is the additional opportunity to make behavioral observations under standardized conditions. Persons with average or above average intelligence comprehend the instructions without delay. Subjects with below average mental abilities are likely to have difficulties in comprehending the instructions and may require additional explanation.

Due to inter-individual differences in the ability to comprehend the instructions, it is usually more effective to examine small, relatively homogeneous groups rather than large groups in which levels of intelligence are likely to vary substantially. In our experience to date, subjects who were not able to understand these instructions in a group setting generally had IQs on the Hamburg-Wechsler Intelligenztest für Erwachsene* of 88 or lower, that is, a "very low" to "extremely low" intelligence level. In our experience, 6.7% of the general population have shown problems in understanding the instructions, and have had difficulty participating in group administrations of the test due to intellectual impairments. Individual administration, however, is usually quite feasible for the individuals.

To assess whether all the subjects have in fact understood the instructions and have marked their answer sheets accordingly, the examiner continues with:

"Let's take a look at whether you have crossed out all the right letters. Every one of the letters in the practice line has a number underneath it. I'll slowly read out the numbers of the letters which you were asked to cross out. You can see whether you have overlooked any of the letters, or whether you have perhaps crossed out too many. For example, you were expected to cross out the first letter because it is a 'd' with two dashes on the top, then the third letter because it is a 'd', but this time with one dash above and one dash below which makes two all together, then the letters numbered 5, 6, 9, 12, 13, 17, 19 and 22. Did you cross out all these numbers? Did anybody cross out more letters or fewer ones? In case you have crossed out a letter which you were not supposed to, you can correct this mistake by crossing the letter out with a second line."

Any questions arising at this moment are answered, and then the following instructions are given:

"Please do not turn your recording blank over yet. Put your pencil down for a moment and listen carefully now. On the other side of your recording blank you will see 14 lines with the same letters you have worked on in the practice line. For each one of the 14 lines you should start on the left side, work to the right and cross out each 'd' with two dashes. This is exactly the same task you did in the practice line. Start with the first line. After 20 seconds I'll say: 'Stop, next line' and you will stop working on that line and immediately start working on the next line. After another 20 seconds I'll say 'Stop, next line' and you will immediately start working on the next line. *Work as quickly as you can without making mistakes.*"

This last sentence should be given verbatim, with equal emphasis on "as quickly as you can" and on "without making mistakes" so that speed of work (and thus the quantity of performance) and degree of carefulness (avoiding errors) are equally highlighted. If there are no questions at this point, the instructions are continued with:

"Now, please turn the page over, so that the first line is on top. In the upper left hand corner you will see an arrow pointing to where you should start working on the first line."

As soon as the participants have all turned over their test forms according to the instructions, they are told:

"Pick up your pencil and when I give the order start working on the first line. Ready! Set! Go!"

The stop watch or timer is started at "Go!" and after 20 seconds the examiner calls "Stop, next line" which is

* The "Hamburg-Wechsler-Intelligenztest für Erwachsene" is the German adaptation of the Wechsler Bellevue Adult Intelligence Scale (1981).

"Work as quickly as you can without making mistakes. Now, please turn the page over, so that the first line is on top. Don't pick up your pencils yet. In the upper left hand corner you will see an arrow pointing to where you should start working on the first line. Pick up your pencils now and start. Ready! Set! Go!"

Modified Test Instructions

The standardized instructions, with 20 seconds of working time allotted for each of the lines, make it possible to administer the test to a broad spectrum of age groups with various levels of performance ability. These time limits are appropriate to allow for the optimal floor of the test in the lower ranges of the scale. In special cases changes in these instructions are admissible. We describe here the applicability of two sets of modifications:

Version A consists of decreasing the time limit for each line to 15 seconds. The working curve and the possibility of computing the fluctuation rate are preserved. Increasing the pressure by shortening the time limit may weaken the component of carefulness in less efficient subjects, thus inducing more errors of omission (E_1) and a greater likelihood of S-Syndromes (Skipping Syndrome – see next page). Version A is appropriate in cases in which a ceiling effect has to be avoided, and should thus be limited (1) to subjects with above-average performing abilities (for example, highly talented athletes who customarily have concentration abilities in a range far above average) and (2) to use as a retest. In both cases the capacity for differentiating performance in the upper ranges can be increased.

Version B makes no use of a time limit for individual lines and instead allows a total working time of four minutes, **which is not mentioned in the instructions.** Like Version A, this variation reduces ceiling effects. But in this case, by reducing the time pressure, an improvement in the level of carefulness can result, producing a somewhat smaller number of errors of omission (E_1). However, the working curve and the fluctuation rate can no longer be established, which is disadvantageous for diagnostic work. The measure of fluctuation rate has a lower degree of reliability and is generally less meaningful in working with normal subjects, but it can be of use in differential diagnostics, as was seen in the work of Rauchfleisch's (1983) work on psychiatric patients, and Eser's (1987) work on at-risk adolescents.

It should be emphasized that norms based on the standard instructions cannot be applied directly to results obtained by using the modified form of instructions. It is suggested that the standard instructions be used wherever possible.

Summary

Briefly, the essential parts of the instructions are:

1) information on the purpose of the test: the measurement of concentration (this applies to all versions).
2) a clear definition of the task: crossing out every letter "d" which has two vertical markings or dashes (this applies to all versions)
3) a check on the subject's comprehension of the instructions with the help of the practice line (useful for all versions)
4) the indication that after every 20 seconds a command is given to start the next line immediately (relevant only for the standard instructions; in Version A the time limit for each line is reduced to 15 seconds; Version B has no subdivided time limits)
5) the instruction to work "as quickly as possible without making mistakes" (applies to all versions)

APPENDIX VIII
Word Analysis

Word Count Results

234	i
215	the
123	to
112	walk
109	and
89	was
82	a
67	it
55	of
54	more
50	today
49	as
41	my
41	entry
40	that
40	in
39	this
39	on
36	had
34	me
28	also
27	not
27	have
26	felt
25	day
24	than
23	we
23	walks
21	with
21	which
21	quite
20	school
19	time
19	t
19	from

19 do
19 be
18 during
17 when
17 very
17 is
17 for
17 but
16 people
16 did
16 after
15 relaxed
15 found
14 some
14 however
14 at
13 enjoyed
12 so
12 nature
12 feel
12 didn
12 been
12 able
11 were
11 walking
11 relaxing
11 like
11 good
10 these
10 stress
10 much
10 mood
10 lot
10 group
10 first
10 am
10 all
10 about
9 seemed

9 nice
9 because
8 would
8 there
8 really
8 participant
8 noticed
8 myself
8 mind
8 less
8 last
8 home
8 helped
7 woods
7 used
7 things
7 s
7 out
7 having
7 got
7 forest
7 enjoyable
7 enjoy
7 different
7 days
7 concentrate
7 better
7 although
6 work
6 usually
6 tired
6 think
6 them
6 test
6 spent
6 part
6 other
6 longer
6 if

6 homework
6 get
6 friends
6 find
6 due
6 could
6 calm
6 by
6 bit
6 an
5 will
5 who
5 went
5 way
5 walked
5 up
5 trees
5 thought
5 talking
5 talk
5 such
5 stressed
5 or
5 only
5 may
5 made
5 look
5 little
5 just
5 interesting
5 how
5 go
5 friend
5 fresh
5 forward
5 focus
5 easier
5 despite
5 before

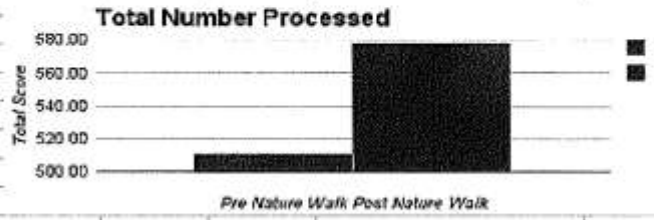
5 around

5 are

5 afterwards

APPENDIX IX
RAW DATA/INFERENTIAL STATISTICS

CP					
Participant	Pre	Post	Posttest-Pretest D	D2	
2	268	253	-15	225	11
5	173	210	37	1369	8
6	228	280	52	2704	5
7	199	224	25	625	9
8	199	263	64	4096	2
9	178	235	57	3249	4
10	212	278	66	4356	1
11	201	239	38	1444	7
13	220	226	6	36	10
15	220	263	43	1849	6
16	236	298	62	3844	3
p<.0002	212.18	251.73	435	23797	
TN					
2	602	629	27	729	9
5	547	502	-45	2025	11
6	529	623	94	8836	5
7	479	528	49	2401	8
8	474	597	123	15129	1
9	426	547	121	14641	2
10	509	612	103	10609	4
11	484	553	69	4761	7
13	520	527	7	49	10
15	519	594	75	5625	6
16	537	652	115	13225	3
p<.001					
	511.45	578.55	738	78030	



CP Data

VassarStats Printable Report
t-Test for Correlated Samples
Sat Mar 09 2013 14:37:38 GMT+0100 (W. Europe Standard Time)

Values entered:

count	X_a	X_b	$X_a - X_b$
1	268	253	15
2	173	210	-37
3	228	280	-52
4	199	224	-25
5	199	263	-64
6	178	235	-57
7	212	278	-66
8	201	239	-38
9	220	226	-6
10	220	263	-43
11	236	298	-62

Summary Values

Values	X_a	X_b	$X_a - X_b$
n	11	11	11
sum	2334	2769	-435
mean	212.1818	251.7273	-39.5455
sum_sq	502464	704533	23797
SS	7231.6364	7500.1818	6594.7273
variance	723.1636	750.0182	659.4727
st. dev.	26.8917	27.3865	25.6802

Variances and standard deviations are calculated with denominator = n-1.

$Mean_A - Mean_B$	t	df
-39.5455	-5.11	10

P		
	one-tailed	0.0002295
	two-tailed	0.000459

Home | Click this link only if you did not arrive here via the VassarStats main page.

TN Data

VassarStats Printable Report
t-Test for Correlated Samples
Sat Mar 09 2013 14:38:58 GMT+0100 (W. Europe Standard Time)

Values entered:

count	X_a	X_b	$X_a - X_b$
1	602	629	-27
2	547	502	45
3	529	623	-94
4	479	528	-49
5	474	597	-123
6	426	547	-121
7	509	612	-103
8	484	553	-69
9	520	527	-7
10	519	594	-75
11	537	652	-115

Summary Values

Values	X_a	X_b	$X_a - X_b$
n	11	11	11
sum	5626	6364	-738
mean	511.4545	578.5455	-67.0909
sum_sq	2898514	3706198	78030
SS	21070.7273	24334.7273	28516.9091
variance	2107.0727	2433.4727	2851.6909
st. dev.	45.9029	49.3302	53.4012

Variances and standard deviations are calculated
with denominator = n-1.

$Mean_A - Mean_B$	t	df
-67.0909	-4.17	10

P		
	one-tailed	0.000964
	two-tailed	0.001928

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APPENDIX X
TWO COMPLETE PARTICIPANTS' JOURNALS

Participant #9

Entry #1
I found the walk to be enjoyable. It felt as if I had left behind the worries of schoolwork, etc. The nature walk was also interesting as it is nice to be fully surrounded by plant life. I did not notice a dramatic change in mood, however as the evening progressed, I found myself to feel more comfortable. Completing homework assignments also felt a lot easier. The walk may have subtly relaxed me, and it felt as if life relaxed mood was sustained throughout the evening.

Entry #2

Today I did not feel very different from the walk in the woods. I was tired from the school day, and this may have been a factor contributing to this. The walk didn't seem to noticeably change my mood, rather I felt more physically drained. I did however feel calmer when on the walk.

Entry #3

The walk today was enjoyable and i feel that it had an effect on my mindset. I felt calm during the walk and also afterwards. When I arrived back at school, I reflected on the walk which also helped. I look forward to the walks as it feels as if there has been a difference in my mental state afterwards. The only noticeable disadvantage of the walks is that it indirectly adds a bit of pressure onto academic deadlines, although today was the only day I experienced this.

Entry #4

I feel that the walk today rid me of some stress. I was previously anxious about a maths test tomorrow, although the walk helped me to concentrate when revising. Today I looked forward to the walk, as it often has positive impacts.

Entry #5

Today the walk was effective at improving my mood stress levels and general well-being. I found the walk to be relaxing and entertaining. My evening after the walk was also fun. This walk was my favourite to date, as there was a calm atmosphere within the group and surroundings. The walk improved my state of mind and me look forward to the next.

Entry #6

Today the walk felt as if it was longer and more tiring than usual, however this may have been due to the poor weather conditions. We also walked at a fast pace, which limited the time actually spent in the forest. Due to less time spent in the forest, I think that the benefits

of the nature walks were not as pronounced. That said, I did still enjoy the walk as they help to relieve stress after school.

Participant #10

Entry #1

Today was the first walk. To my surprise I quite enjoyed it, more than I thought I would. I found that walking in the forest/nature is very calming and relaxing. After a long day at school, this walk helped me to relax and to remove the anxiety and stress that I had before. By talking to a friend during the walk, I was able to pass the time a lot easier; it also made it more enjoyable as I was able to socialize in a more relaxing way than I am used to. The only part of the walk that was tedious was the large hill we had to walk up.

Entry #2

Today was the second walk. After a test, it was nice to unwind by walking through the forest. I found myself having a really indepth conversation with a friend which I have not done in a long time. We talked about many things and it helped me to figure out some problems from a difficult class that had been puzzling both of us for awhile. As a result I do not have to worry about the issues anymore. After the walk I felt quite awake and attentive which surprised me.

Entry #3

Today was the third walk. I thought it would be cancelled due to the thunderstorms earlier in the day, however it wasn't. There was no rain during the walk, however it was quite humid. Although the walk was nice and relaxing, the humidity prevented me from feeling as calm and relaxed as I did on the previous two walks. I felt a bit too warm and damp. I spent alot of time trying not to walk in mud and so could not fully concentrate on enjoying the walk. Despite all of this, the walk still helped me get some fresh air, which I had not had all day.

Entry #4

Today was the fourth walk. The weather today was much nicer than on Tuesday. Surprisingly the walk seemed to go alot quicker today than it did on the three previous sessions. The large hill also seemed less of a problem. I felt very relaxed during and after the walk despite having alot of work to do. Although I got home an hour later than I normally do, I didn't feel stressed at all about having to do lots of homework. I just got on with it.

Entry #5

Today was the fifth walk and I am now half way through these sessions. I talked about a lot of things with my friend and this also helped to uplift my mood. We passed a point where I saw two deers two days ago during cross country. Unfortunately they were not to be seen. Once I got home I began to revise for my biology test which is in a few days. I found revising today much easier than when I did it yesterday despite having less time than yesterday. I was able to concentrate quite well when revising and so took in a lot of information.

Entry #6

Today was the sixth walk. During the walk I noticed that I felt quite happy and optimistic more so than at school or at home. Although I had much to do when I got home, I knew that it would be OK so I would be able to get it all done. These problem that I often have were cleared away during the walks. By talking to other people, I was able to laugh which also brightened my mood. The walk today was really enjoyable and I had a lot of fun.

Entry #7

Today was the seventh walk. We went on the longer route today. I liked this as it was a change of scenes and prevented the walk from becoming boring and regimental. The big hill didn't bother me at all and I didn't have any problem walking up it. I noticed that some of the trees have begun to shed their leaves. On other trees the leaves have begun to change color from green to yellow. I had a headache for most of the day but after the walk I forgot about it and the pain simply went.

Entry #8

Today was the eighth walk. The weather was quite nice. Once again I found the walk very relaxing and felt calm after it had finished. After the walk I also felt quite attentive and awake. I have noticed this on most of my walks. This has enabled me to work more efficiently at home.

Entry #9

Today was our 9th walk. It is likely to be our last as the weather forecast for Thursday is not good. There were only three of us on the walk today. We discussed many things such as sports and films. It was quite fun. It was colder today than it was in the past, however we were walking quite quickly. I didn't notice as much.